MISCELLANEOUS PAPERS NOS. 1-12

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ARCHEOLOGICAL REPORT NO. 15

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NOTE

Occasionally, this office receives or produces small papers resulting from the recovery of a few artifacts or the emergency salvage of some cultural remains on a small survey on National Forest lands. We believe these cultural data are just as worthy of publication as more involved or extended excavations. With this issue of the Archeological Reports Series, we initiate a set of Miscellaneous Papers designed to provide data, investigations, and ideas whose presentation involves only a few pages. We trust, that in its own way, the Miscellaneous Papers will become as valuable a source as the more extended reports in this series.

Dee F. Green
Regional Archeologist

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PAPER NUMBER ONE

ARCHEOLOGICAL SALVAGE AT ENM 10636
Carson National Forest, New Mexico

BY
James Terrel and Sally Kleiner

Introduction

The San Juan County Museum Association and Eastern New Mexico University recently completed an archeological salvage project on National Forest lands, Jicarilla Ranger District, Carson National Forest.

The project was initiated at the request of, and under contract with, El Paso Natural Gas Company. It was administered by R. L. Ahrens, representing El Paso Natural Gas Company, and Cynthia Irwin-Williams, who served as the principal investigator for the Division of Conservation Archeology of the San Juan County Museum Association and the Department of Anthropology of Eastern New Mexico University. The field work was conducted by the writers, graduate students from Eastern New Mexico University. We would like to thank Jim Tensfield of the Jicarilla Ranger District who served as Forest Service coordinator on this project. We are also indebted to the following members of the Salmon Ruins staff for help in the analysis: A. H. Warren, ceramics; T. McCormack, lithics; and E. Deal, osteology.

A burial was exposed by a road grader in the course of maintenance work by El Paso Natural Gas Company on a dirt road to gas well 28-4 #6. It runs through an archeological site which has been designated Forest Service Site AR-03-02-03-78 and ENM 10636. The burial is considered to be associated with this site.

The site is located on a hill slope slightly below the top of a ridge which runs northeast-southwest at an elevation of 7,320 feet. This area drains to the north into Leandro Canyon. The vegetation on the ridge is moderately dense and consists of pine, oak, sage, juniper and other shrubs and grasses. Pine needles form a thick covering over much of the site area, making visibility very limited. Unusually heavy rainfall during the salvage operation restricted our ability to locate site boundaries, due to erosion and subsequent covering of materials. A rough estimate of 80 by 50 meters was given to the site area. Lithic and ceramic materials were found scattered over this area, with the greatest concentration of materials visible near the road, to the east, and west of the road. Several hearths were located within this area. The site continues up the ridge to the south of the burial for approximately 35 meters, to the north for about 15 meters, to the west for about 25 meters,

and to the east for about 50 meters. Runoff gullies are found to the east of the burial, and the artifacts were found in these gullies (figure 1).

Salvage Operation

El Paso Natural Gas Company contacted the Jicarilla Ranger District and the Division of Conservation Archeology when the burial was discovered in the road. The Forest Service set up protective barriers around the burial. Division of Conservation Archeology personnel removed the barriers, and the burial was examined and photographed before any work was undertaken. Rainfall in the area during the entire time that the salvage work was undertaken interfered with the operations. Data was collected as efficiently as possible under these adverse conditions.

The burial had first been exposed by the road grader, and was further disturbed by tourists in the area. The area around the skull showed evidence of this disturbance. The burial was flexed, with the skull facing east and the long axis of the skeletal remains oriented southeast-northwest. Debris including dirt, wood, and rocks was left by the road grader to the north of the burial. A fragment of a trough metate was part of this debris. Also included in this debris was a long stone slab approximately one-half meter in length. A few sherds and some lithic material were found on the surface in the vicinity of the burial. Due to the disturbed nature of the burial, it was impossible to tell if any of these artifacts had any direct relationship to the burial itself.

The first procedure in the salvage operation was to clear off a section of the roadcut near the burial to expose a soil profile. This profile revealed a layer of disturbed material from the road construction which averaged about 10 cm. in thickness when measured from the surface. Below this disturbed material was a layer of greyish soil containing large amounts of charcoal and organic matter averaging 15 cm. in thickness. In the area of the burial, this layer appeared as a charcoal- and humic-rich trash deposit. Below this soil layer was a layer of orange colored clay, which appeared to be sterile. The depth of the clay layer in this area could not be determined as it extended below the depth of the profile. The average thickness of the clay layer exposed in the profile was 40-45 cm. (figure 2).

(Site No. AR03-02-03-78 Jicarilla District - Carson National Forest)

ENM 10636

SCALE: 1cm. = 1m. (in area of burial)

(not to scale over the rest of the site area)

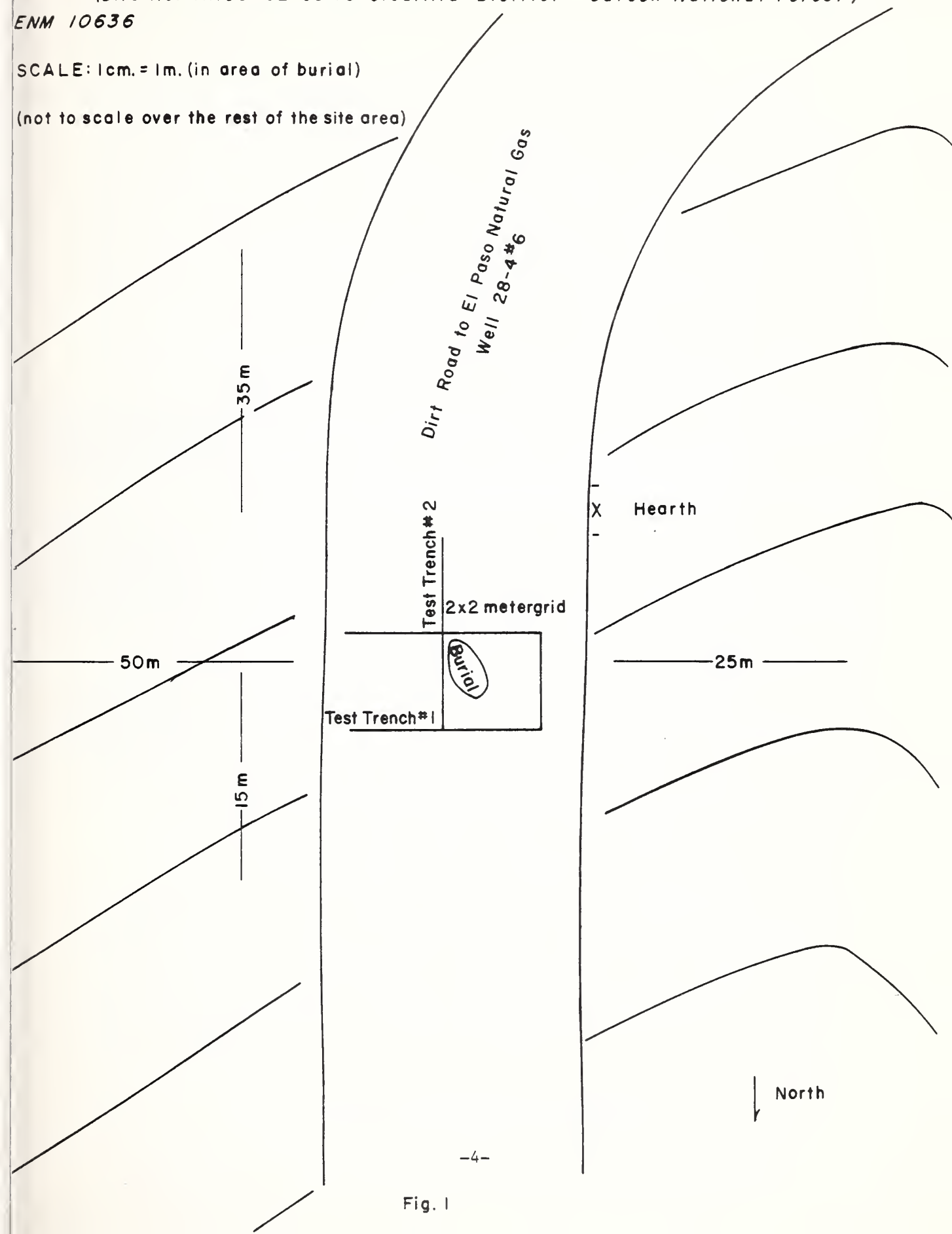
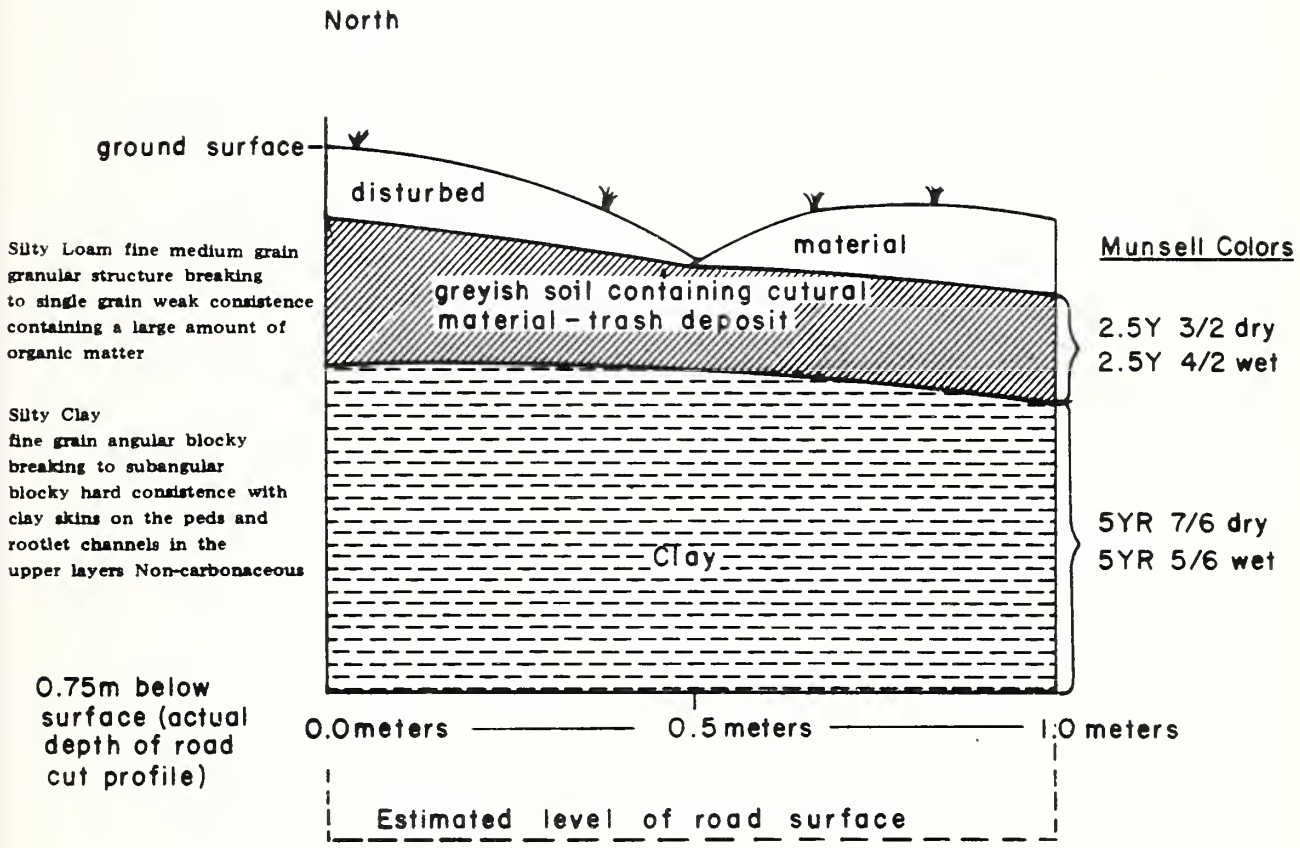


Fig. 1



LEGEND

Trash

Clay

Vegetation

SCALE: 1cm. = 10cm.

FIGURE 2 - ROADCUT PROFILE

The next procedure was to set up a two-by-two meter grid square to encompass the burial. This grid was set up using a compass to run north-south and east-west lines (figure 3). After the grid was set up, the disturbed material left by the road grader was removed from the grid square. Large amounts of charcoal were found in this debris.

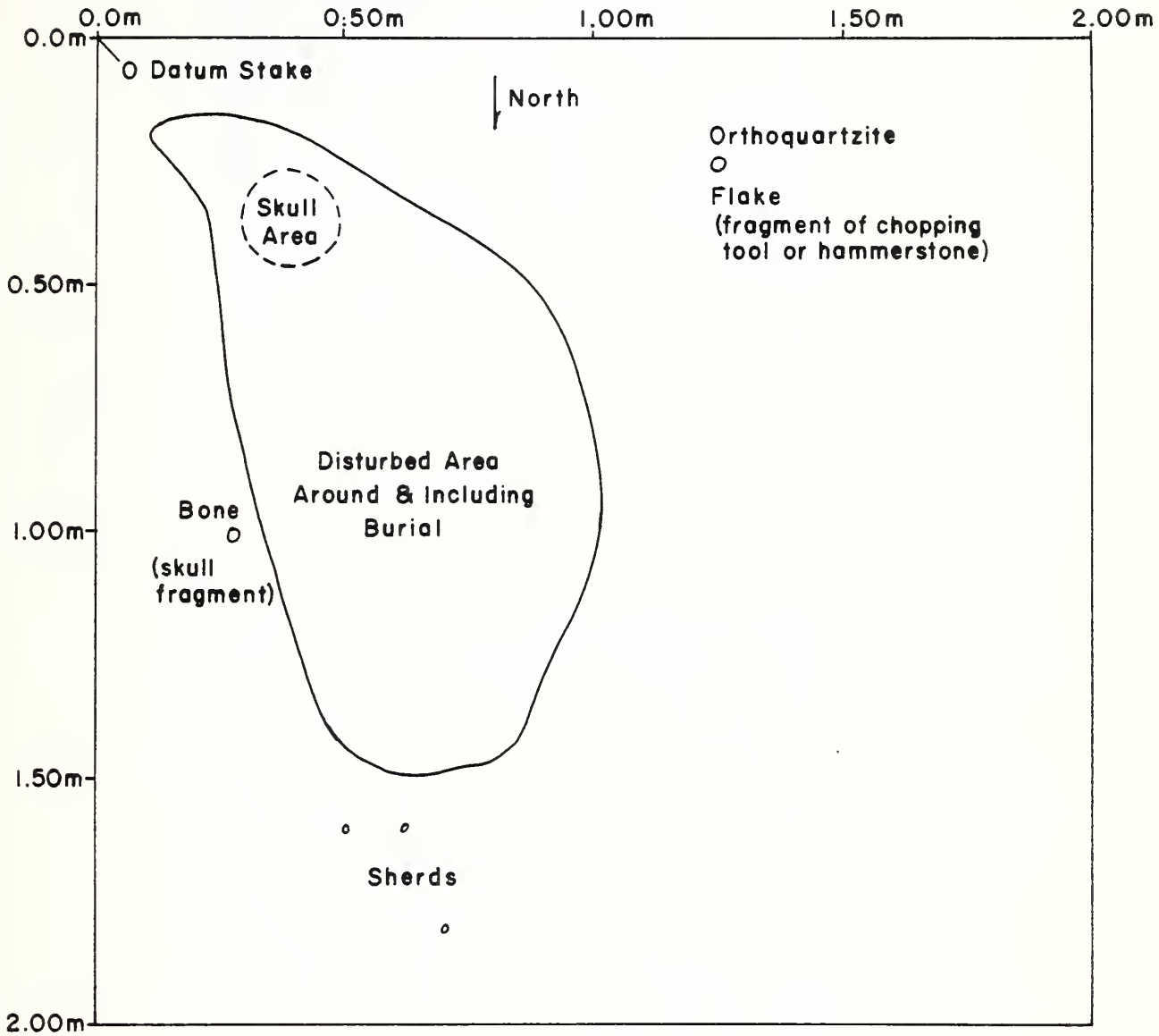
The level of the ground at this point was then designated as 0 depth, with the southeast grid pin chosen as the 0 datum stake. The grid square revealed the orange clay and the charcoal- and humic-rich trash deposit in a mottled pattern to the west of the burial. The trash deposit was continuous in the area of the burial and to the east of it. The trash deposit appeared to continue to the east of the burial, toward the middle of the road. A sketch map of the surface of the grid square was drawn at this point. Artifacts were mapped in as they occurred on the surface of the grid; however, it is not certain that they are in their original context and may have been subject to disturbance from the grading of the road.

Next a 10 cm. level was excavated around the burial, as an arbitrary level from the 0 datum point. The orange clay became quite uniform to the west of the burial. Since this clay had previously been found to be sterile, the western half of the grid was not excavated below this point. In the area of the burial and to the east of the burial, the humic- and charcoal-rich trash deposit continued (figure 4). A few sherds, flakes, and some bone (mostly rodent, some human bone fragments) were found in this level.

The eastern half of the grid was then excavated to 20 cm. below datum, leaving a pedestal around the burial (figure 5). Several sherds, some of which were extremely charred, were found in the northeast corner of the grid within this level. One sherd of Rosa-Basket Impressed was found in this level to the south of the skull. Association of these artifacts with the burial cannot be assumed due to the disturbed nature of the burial and the trash deposit.

Next the skeletal remains were cleaned off, and an attempt was made to locate parts of the skeleton which were not apparent. Most of the vertebrae, the left arm, most of the feet, the mandible and other bones were missing.

FIG. 3 GRID SQUARE AT 0 DATUM LEVEL
(with surface debris cleared)



SCALE: 1cm. = 10cm

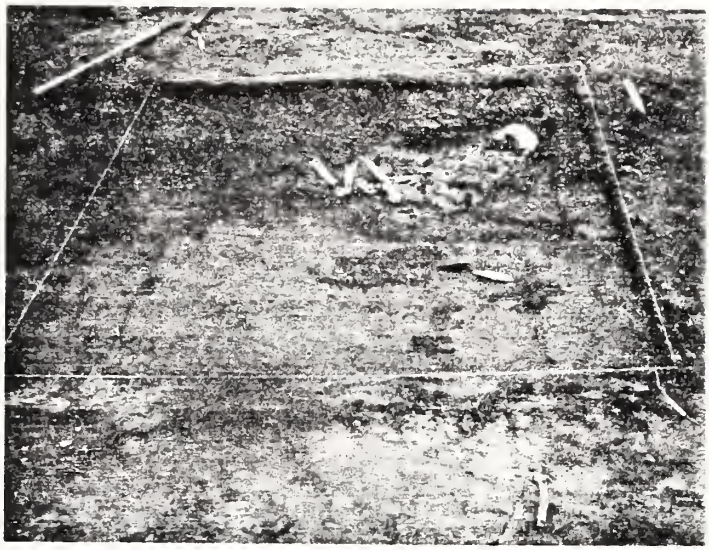


Figure 4--Burial grid square showing trash and sterile clay areas.

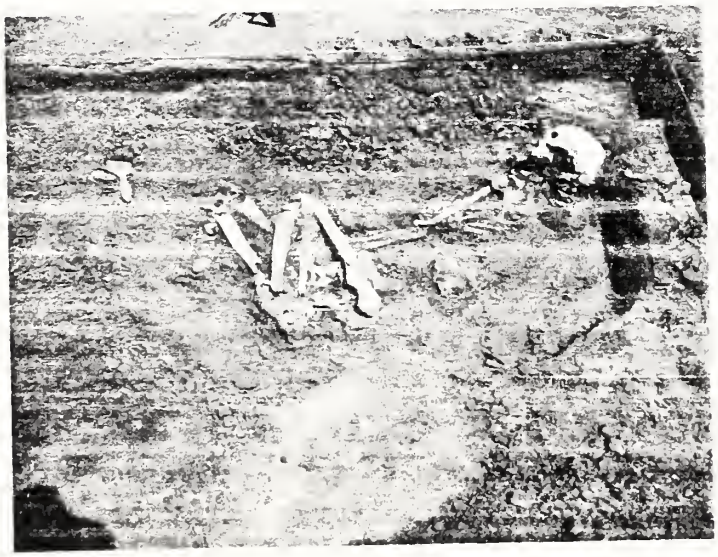


Figure 5--Closeup of burial.

A map of the skeletal remains as they occurred in the grid was drawn. The depth of the skeletal remains was measured at the lowest point of occurrence in the trash deposit (figure 6).

The bones were then removed from the earth and wrapped and boxed. Rain in the area during the excavation of the skeletal remains made this procedure difficult. Some of the bones were very soft and broke apart during this removal. Most of the skull was well preserved, with the exception of the back of the right side which was lying in the soft trash deposit. The skeletal remains were contained within the trash deposit, resting on the orange clay layer below the trash deposit. No cultural materials were found in the clay, confirming this layer as a sterile deposit.

After the skeleton was removed, three test trenches were made in the road to examine the possibility of more cultural remains being encountered when the grading of the road was continued. Two trenches were put in running east-west across the road, and one trench running north-south. These trenches extended out from the grid square, one from the northeast corner, one from the southeast corner. The trenches were extremely difficult to dig due to the compact nature of the material in the road, especially the orange clay which was extremely hard when dry. The trenches were excavated approximately 20 cm. in depth, or to the point where the orange clay layer appeared to be uniform and the trash deposit no longer continued. Examination of the trenches revealed that the trash deposit was quite thin to the east and south of the grid square, so that the likelihood of encountering a subsurface concentration of cultural materials within the road was quite small. Profiles were drawn of the trench running east-west from the northeast corner, test trench #1, and of the trench running north-south from the southeast corner, test trench #2 (figure 7). The southern and eastern walls of the grid square were also profiled (figure 8) and photographed.

After completion of the salvage operation, the grid square and the trenches were backfilled.

FIG. 6 LOCATION OF SKELETAL REMAINS IN GRID SQUARE

(Grid square extends to 2.0 meters to the north and west-not shown)

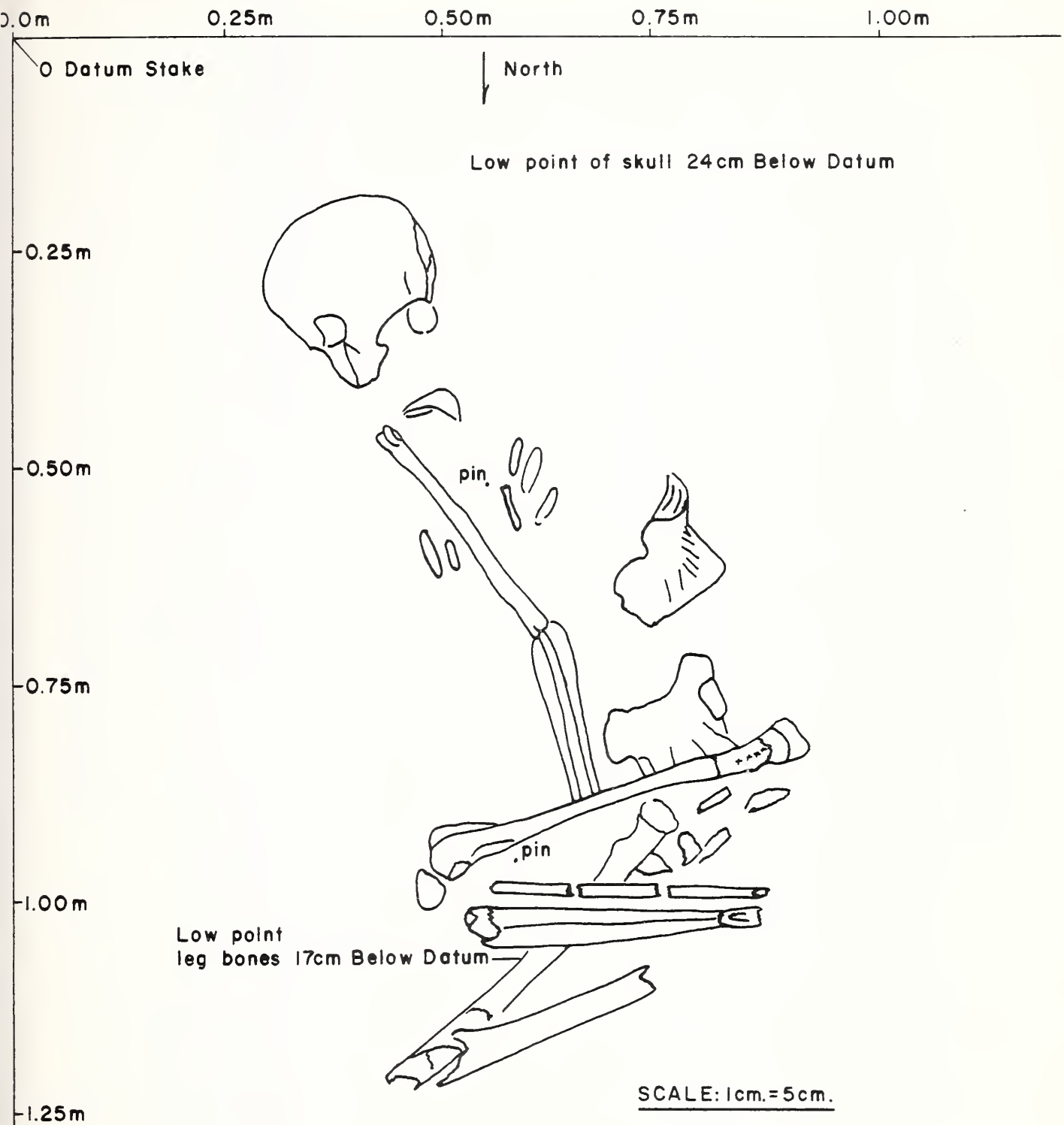


FIGURE 7 A - TEST TRENCH #1 PROFILE

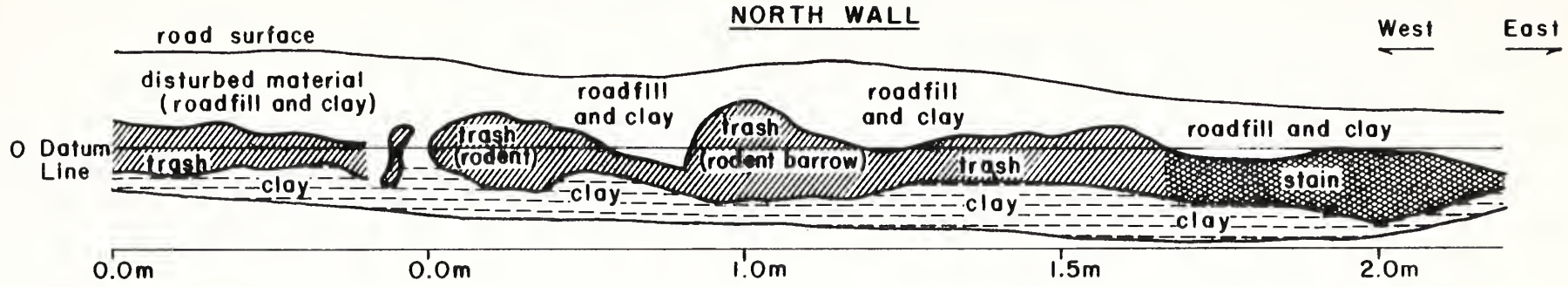
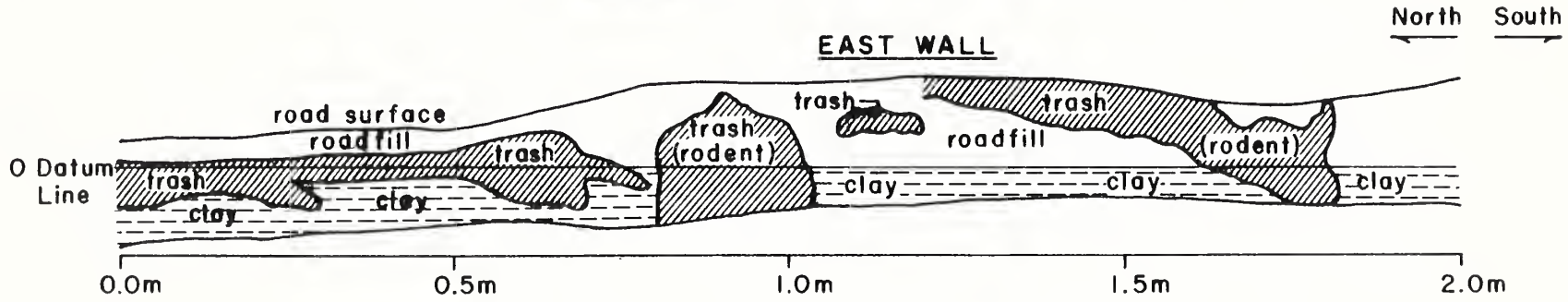


FIGURE 7 B - TEST TRENCH #2 PROFILE



LEGEND

Trash

Clay

SCALE: 1cm=10cm

FIGURE 7 TEST TRENCH PROFILE

FIGURE 8 A - SOUTHERN PROFILE OF GRID SQUARE

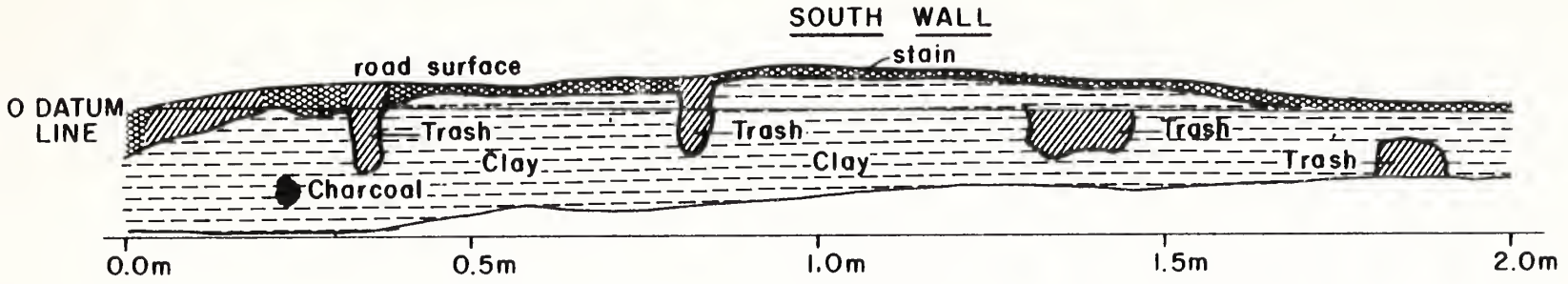
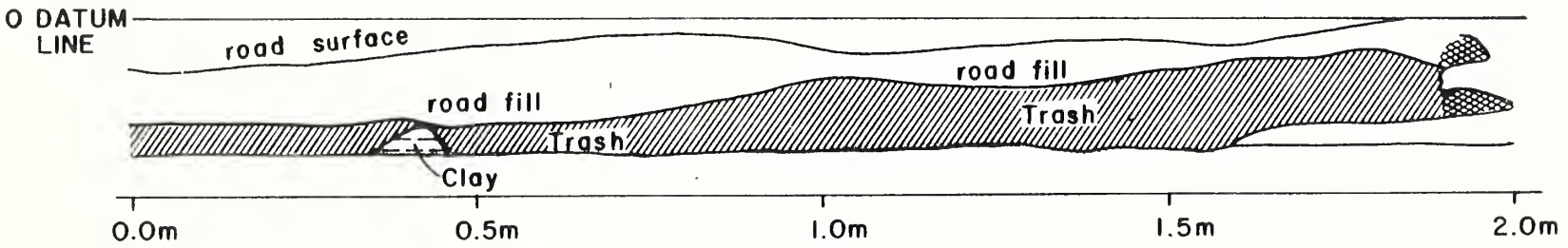


FIGURE 8 B - EASTERN PROFILE OF GRID SQUARE



LEGEND

Trash

Clay

Stain

SCALE: 1cm=10cm

FIGURE 8 - GRID SQUARE WALL PROFILES

Summary

The skeletal remains were disturbed by the road grader, by tourists and by inclement weather prior to their examination by the writers. It should be noted that both El Paso Natural Gas Company and the Forest Service Rangers cooperated in protecting the remains until the salvage work was completed. However, the prior disturbance of the burial makes it very difficult to make any definite statements about the archeological context of the burial itself or its relationship to site ENM 10636. The skeletal analysis revealed that the remains were of a fully adult male between the age of 25 and 50 years old. However, the cultural chronological identification of site ENM 10636, with which the burial is associated, is somewhat difficult.

On the basis of the ceramic types found at the site and the time periods with which the ceramics are associated, it is suggested that the dates tend to cluster in the period 700-900 A.D., or the Rosa Phase (700-850 A.D.) as defined by F. W. Eddy (1966) or the Pueblo I time period in the Pecos chronology. One ceramic type, Zia Ware, which is dated 1692 A.D., was noted. However, the occurrence of seven other pottery types from a much earlier time period tend to suggest that this type is not associated with the primary occupation of the site and probably relates to a much later occupation in the area. Pottery types slightly earlier and slightly later than the Rosa Phase were noted, suggesting that the occupation may have started slightly before and continued slightly after the dates given for the Rosa Phase.

The thickness of the trash deposit noted in the area of the burial and in the test trenches suggest that the occupation in the area probably continued for some time, rather than being a temporary camp location. Although no evidence of structures was noted at the site, pit houses or surface structures may exist in the area of the site, since structures of this type are commonly associated with Pueblo I occupations of a permanent nature in this area. Poor visibility due to heavy ground cover and interference due to heavy rainfall in the area during the project may have obscured evidence of such structures.

Table 1 - Sherd Type List

Analysis by A. H. Warren

Depth	Sherd Type	Dates*
Surface	Obelisk Gray	620 - 675 A.D. (may have lasted up to 750 A.D.)
	Rosa Brown	702 - 898 A.D.
	Twin Trees Black on White	800s A.D.
	Piedra Brown	750 - 850 A.D.
	Zia Ware	Post Pueblo Revolt (after 1692 A.D.)
0 - 10 cm. Below Datum	Twin Trees and/or Piedra (Plain polished brown ware with igneous temper)	500 - 900 A.D.
	Bluff Black on Red	800 - 900 A.D.
10 - 20 cm. Below Datum	Twin Trees Black on White	800s A.D.
	Twin Trees Plain	500 - 900 A.D.
	Sambrito Brown	400 - 750 A.D.
	Rosa (basket impressed)	702 - 898 A.D.

*Dates given are from A. H. Warren and D. Breternitz (1963).

Table 2 - Lithic Materials List

Analysis by T. McCormack

Depth	Artifact Type	Material
Surface*	Retouched without projection flake	Chalcedony
	Retouched and utilized without projection flake	Chalcedonic Chert
	Polishing stone	Fine-grain igneous rock
	Trough metate fragment	Not analyzed
	Mono fragment	Not analyzed
0 - 10 cm. Below Datum	2 debitage flakes (1 flake not retouched or utilized) (1 fragment of chopping tool or hammerstone)	Orthoquartzite
0 - 20 cm. Below Datum	None	

*This list does not represent the complete inventory of lithic materials present at ENM 10636. Other artifacts were left in situ at the site.

Skeletal Analysis

Analysis by E. Deal

Inventory

Fragments of right and left fibula
Right and left tibia (partial)
Right and left femur
Right patella
Right and left pelvis (partial)
Right humerus
Right proximal ulna
Right proximal radius
Atlas
Axis
Three metacarpals
Right scapula (partial)
One metatarsal
One tarsal
Skull minus mandible
Several unidentifiable fragments of human bone

Sex

Greater sciatic notch, mastoid process, and general robusticity of the pelvis and femora indicate that this individual was a male.

Age

This individual was fully adult, at least 25 years old. Extreme wear of maxillary dentition and loss of all but the right first molar indicate an age much in excess of 25 years, possibly as much as 40 to 50 years of age. This sort of age estimate is highly subjective; but, because of the incomplete nature of the skeletal remains, it is the only estimate which is possible.

References

Breternitz, David
1963 An Appraisal of Tree-Ring Dated Pottery in the Southwest. Anthropological Papers of the University of Arizona, Number 10. University of Arizona Press, Tucson.

Eddy, Frank W.
1966 Prehistory of the Navajo Reservoir District Northwestern New Mexico. Museum of New Mexico Papers in Anthropology Number 15. Museum of New Mexico Press, Santa Fe.

PAPER NUMBER TWO

AN ARCHEOLOGICAL REPORT ON THE MATERIALS RECOVERED FROM SITE 01-113
Coconino National Forest, Arizona

BY
Landon D. Smith

Introduction

In August of 1974, approximately 20 acres of land were surveyed by a U. S. Forest Service archeologist as part of a clearance investigation concerning the Bullard land exchange (A-7982). This acreage is located in T. 14 N., R. 4 E., section 12, of the Beaver Creek Ranger District, Coconino National Forest, Arizona. In the course of this survey, one site was located and further testing and examination were recommended. Additionally, three specific areas were suggested for investigation: (1) the possible age of the site, (2) the stratigraphic depth of the site, and (3) the cultural affiliation represented by the artifacts (Wylie 1974). This suggested examination was completed on December 19, 1974, by the author and Dee F. Green, Regional Archeologist, U. S. Forest Service. The following report discusses the resurvey of this site and the results of the analysis of the materials recovered therefrom.

The Site Locality

The elevation of the site is approximately 3,200 feet above sea level. It is located principally on a small knoll of a locally occurring limestone overlooking the Verde River which lies about 3 kilometers to the south and southeast. Some materials appear to have washed down the south face of this knoll. Soil cover on the outcropping is sparse to nonexistent and generally supports little vegetation on the site location itself. The plant cover of the immediate area may be characterized as desert grassland; and the dominant plants observed are creosote (Larrea tridentata), grey oak (Quercus grisea), yucca, and several species of cactus.

The site itself consists of a small scatter of tools and lithic debris spread over an area of approximately 30 square meters. It was felt during the first survey that the site should be tested to determine its possible depth as well as its archeological significance in the wider sense. Our subsequent examination indicated that all materials are located solely on the surface; and, this being the case, everything evidencing purposive human action was collected.

The Analysis

The surface collection produced a total of 16 pieces of material including possible tools, cores, and general debitage or waste of the lithic manufacturing process. Though the majority of pieces were of basalt, four pieces of chalcedony were also found. All pieces were examined for signs of wear or use by using a binocular microscope with a power ranging from 7x to 300x. That no signs of wear or use were found should not be taken as proof conclusive that the pieces were not utilized in some fashion. The very hard character of the materials (principally basalt) preclude any but the most pronounced use from leaving signs. Additionally, recent ethnological work along these lines suggests that many flakes commonly classified as waste receive very little use when they are utilized (Gould 1969); indeed, microscopic examination of pieces that were known to have been used for such purposes as skinning revealed no detectable signs of the use.

After each piece had been drawn, all debitage had a series of further observations and measurements made on it (table 1). The particular attributes selected were chosen for several reasons. First, experience of a subjective nature on the part of replicators of lithic tools from numerous countries has indicated the importance and relationship of several of these attributes with various modes of production; e.g., the use of a soft hammer or baton as opposed to the use of a hard hammerstone. Second, recent, but as yet not widely reported, quantitative work with experimentally produced debitage populations has statistically supported the significance of these attributes (Smith and Goodyear 1974).

The analysis obviously has focused on the descriptive, but this was necessitated by the constraints imposed by the nature of the material. Surface scatters such as this represent a problem to the archeologist for several reasons. The crude nature of the artifacts suggests some antiquity to many investigators; however, typically, datable materials seldom occur associated with the artifacts such as potential carbon 14 or dendro samples. Further, the very nature of the scatters (i.e., that they are solely lithic) has been considered by some to suggest the possibility of a preceramic assemblage. It may well be closer to the fact to characterize them as merely aceramic (that is, having no ceramics) rather than to suggest that they are from a period before the introduction of ceramics.

OBSERVATIONS ON THE MATERIAL FROM AR-03-04-01-113

Artifact Number	Platform Width (MM)	Platform Length (MM)	Platform Condition	Flake Width (MM)	Flake Length (MM)	Bulb	Bulb Thickness (MM)	Maximum Thickness of Flake at Middle (MM)	Termination Condition	Striations	Ondulations	Description of Piece	Retouched	Material
113/1	34.5	80.3	Intact	80.5	94.0	Yes	--	22.4	--	Yes	No	Primary Flake	Yes	Basalt
113/2	--	--	Absent	69.6	71.8	Yes	21.7	20.6	Feathered	No	Yes	Flake	Yes	Basalt
113/3	14.1	33.9	Intact	33.9	26.2	No	--	8.2	Hinged	Yes	Yes	Flake	No	Basalt
113/4	9.2	16.9	Intact	28.4	42.8	Yes	7.7	7.1	Feathered	Yes	Yes	Secondary Flake	No	Basalt
113/5	11.1	22.3	Intact	26.5	36.5	No	--	7.6	Hinged	No	No	Secondary Flake	No	Basalt
113/6	10.2	16.1	Intact	19.8	30.0	Yes	10.0	6.6	--	No	No	Flake	No	Basalt
113/7	6.4	13.0	Intact	37.2	29.8	No	--	9.5	Feathered	Yes	No	Secondary Flake	No	Basalt
113/8	*See Note Below											Piece		Basalt
113/9	6.6	10.5	Intact	14.3	30.3	No	--	4.6	Feathered	No	No	Flake	No	Basalt
113/10	--	--	Crushed	19.0	35.0	Yes	4.6	9.1	Feathered	No	No	Flake	No	Basalt
113/11	*See Note Below											Medial Section		Basalt
113/12	9.1	21.5	Intact	36.2	28.7	No	--	9.3	Feathered	No	No	Secondary Flake	No	Basalt
113/13	*See Note Below											Core		Chalcedony
113/14	*See Note Below											Piece		Chalcedony
113/15	*See Note Below											Piece		Chalcedony
113/16	4.9	12.7	Intact	22.8	23.8	Yes	5.3	4.9	Feathered	Yes	Yes	Flake	Yes	Chalcedony

*Note--Cores or pieces were not measured.

Many of the pieces were secondary decortication flakes. These are flakes having some cortex still adhering to them, but also showing previous flake scars. (See Crabtree 1972 for a complete discussion of the terms and techniques associated with lithic manufacture.)

The one possible tool found (113/1) was made on a primary decortication flake, and all of the other pieces were either flakes or cores. It is interesting to note that all of the cores found that were recognizable as such were of a siliceous material while the overwhelming majority of the debitage was basalt. This may indicate the importance of the siliceous flakes produced compared to the basaltic ones which were evidently allowed to lie, probably where they fell. On the other hand, any flakes of SiO_2 were either retained as such or made into tools which were also kept. In any case, none were associated with the cores.

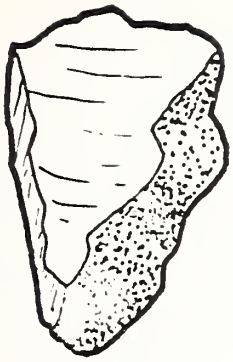
Some patterns are suggested by examining the observations made on the material (table 1). Both platform and flake dimensions appear rather uniform for the majority of pieces. Flake maximum thicknesses, when measured at the approximate middle of the flake, are somewhat more variable; but this is understandable when consideration is given to the rather intractable nature of the basalt. No platform shows any preparation or faceting such as those associated usually with the more complicated or exacting flaking and production procedures, such as those associated with blade manufacture. Finally, the condition of the platforms only showed crushing in just one case in spite of the fact that the flaking was most probably done with a hammerstone rather than with some other softer billet of wood or antler. This probably results from the very compact nature of the material being worked.

Conclusions

It is impossible to make any assessment as to the possible age of the behavior represented by the scatter of lithic material. It could literally be the product of any period from the earliest times to even after Anglo contact and settlement of the area. In instances of roughly similar scatters of rather crude appearing lithic materials in Arizona, referred to as the Tolchaco Complex, a controversy still continues as to their temporal locus and meaning (Bartlett 1943, Wormington 1957, Krieger 1964, Willey 1966). It is felt that the material at this site resulted from one or two instances

of chipping behavior of a very short duration. The materials present are not numerous as would be expected at a site representing any long occupation, repeated use, or any other extensive activity. The cultural affiliation of these materials cannot even be guessed at since all or any Indian groups of the general area could have produced them.

Similarly, little can be suggested as to possible uses for the one morphologically apparent tool or, indeed, for any of the flakes. The absence of signs of use may be attributed to the physical nature of the materials as easily as it may be associated with any suggested possible use.



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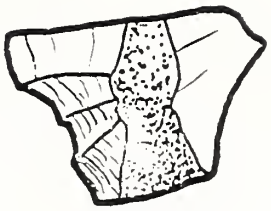

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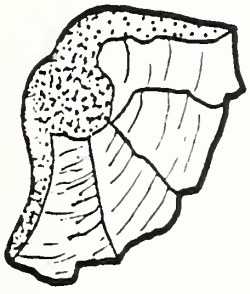

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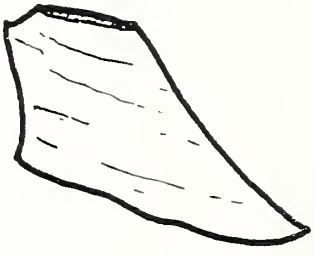

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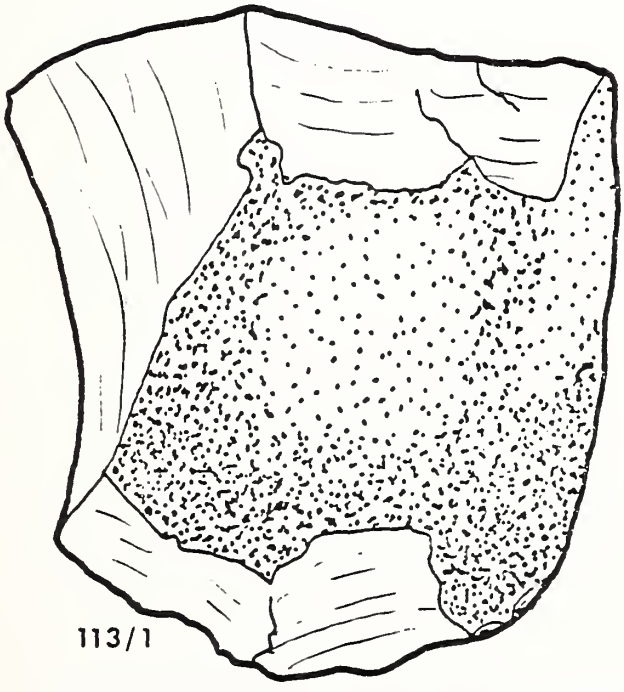

113/1

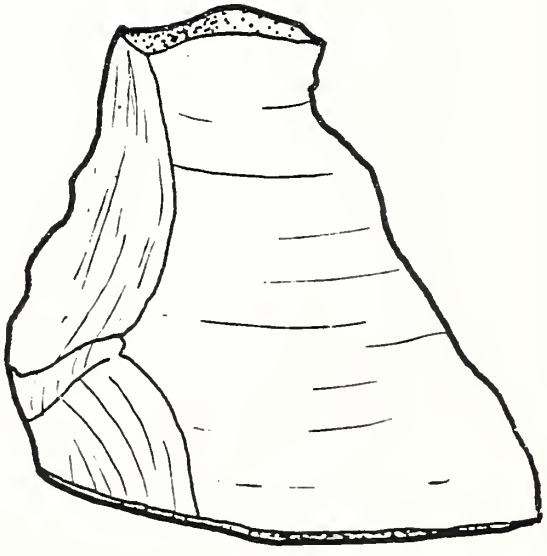

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FIGURE 1. Tools and debitage recovered from AR-03-04-01-113.

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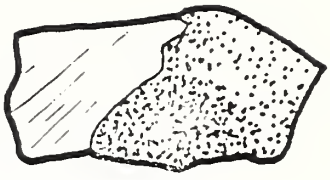

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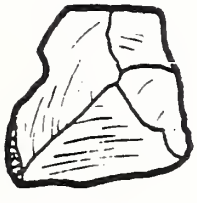

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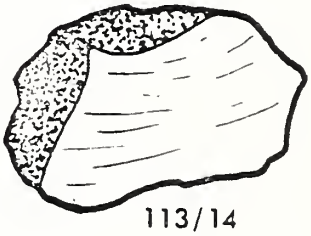

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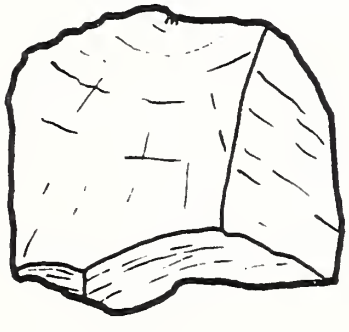

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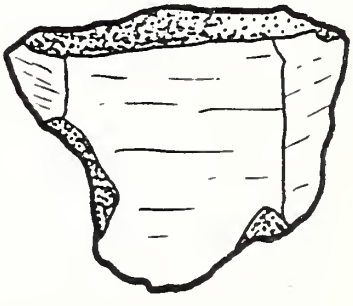

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FIGURE 2. Cores and debitage from AR-03-04-01-113.

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PAPER NUMBER THREE

SURFACE ARTIFACTS FROM SITE 08-7
Apache-Sitgreaves National Forest, Arizona

BY
Dee F. Green

Introduction

The surface site reported in this paper was discovered in connection with the survey of a proposed land exchange on the Pinedale Ranger District, Apache-Sitgreaves National Forest. The site (AR-03-01-08-7) consisted of 50 square meters of very scattered lithic and ceramic material. Precise locational data is available from the Forest Service for legitimate scholars.

Two loci were noted: one consisting of a concentration of 19 sherds from a redware jar, and the second consisting of a basal notched point (figure 1,b), a flake scraper (figure 1,e), and several black-on-white sherds. An additional point (figure 1,a), five utilized flakes, and a couple of grey sherds were found scattered in the area. More detail on the artifacts is given below. The site is located atop a small, flat hill in open juniper forest overlooking Hog Wash. There are a few widely scattered pinyon and some opuntia is present, but there is little ground cover. The hill on which the site is located is exposed south at about 2% slope and is formed of basalt which is exposed around the edges and sometimes outcrops on top. The little soil present is shallow, red, and very gravely. The site is located about $\frac{1}{4}$ mile from sites NA 10515 and NA 10516. All surface material was removed. The prehistoric use pattern seems to have been highly disbursed, low intensity hunting/gathering.

Artifacts from Site AR-03-01-08-7

Forty-two specimens, all from the surface, were found at the site. Eight of the artifacts are chipped stone, all of a grey chert; and the remaining 34 specimens are pottery fragments. No ground stone tools were found.

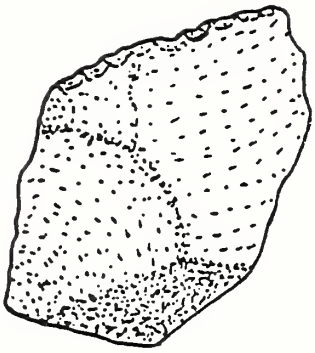
Lithic Specimens

Utilized flakes. Five specimens all showing worn or used surfaces. Manufactured on flakes of grey chert.

Retouched scraper. One specimen (figure 1,c) made on a grey chert flake with obvious retouch along one edge. The specimen measures 5.2 centimeters long and 3.7 centimeters maximum width. The retouched edge is 3.3 centimeters long.

a.

b.



c.

d.

e.

Figure 1 - a. Side notched point; b. Side and basal notched point; c. Scraper; d. Black-on-White pottery; e. Rim profile from redware jar. All figures actual size.

Points. Two specimens, both of grey chert. The first, a side notched point (figure 1, a), is 1.6 centimeters maximum width and 4.9 centimeters long. The tip is broken and probably extended for an additional 3 millimeters. It weighs 3.55 grams. The second specimen (figure 1, b) is both side and basal notched and measures 2.5 centimeters long, 1.5 centimeters maximum width, 1.2 centimeters wide above the side notches, and .7 centimeters between the side notches. The side notches are .3 millimeters deep, and the basal notch .2 millimeters deep. The specimen weighs .80 grams.

Ceramic Specimens

At least four vessels are represented by the 34 sherds recovered. They are grouped below on the basis of analysis of the attributes of surface finish, color, and temper rather than by type name. The temper identifications were made by Jack Pardee, Geologist, U.S. Forest Service, Southwestern Region. All colors are after Munsell Soil Color Charts.

Black-on-White Wares. Five small body sherds with exterior slip and black mineral paint decoration. Interiors have been wiped, and the striations are prominent. Temper is quartz. The core color is grey 7.5YR 8/0, and the slip is white 10YR 8/4. Black paint is 10YR 3/1. The sherds average 5 millimeters thick.

Ten small body sherds unslipped with black mineral paint. The interiors are smooth, but show no wiping marks. Paste color is lighter than those above 5YR 7/1. Surface color is 10YR 8/4, and the paint is 10YR 3/1. The largest sherd is illustrated in figure 1, d. Sherds average 5 millimeters thick.

Seven small body sherds with coiling, not quite obliterated on the outside, but smoothed on the inside. The exterior surface is brown 5YR 4/3, changing through the vessel wall to a 2.5YR 6/8 red orange. The temper is a very sharp angular quartz which appears to have been broken from quartz fragments rather than from stream washed sand. Sherds average 6 millimeters thick.

Nine body sherds and three rim sherds (figure 1, e) from a plain red (2.5YR 6/8) jar. The exterior is smoothed, and

PAPER NUMBER FOUR

SURFACE MATERIALS FROM SITE 06-122
Coconino National Forest, Arizona

BY
Dee F. Green and Henry G. Wylie

Introduction

In connection with a proposed land exchange on the Sedona Ranger District, Coconino National Forest, an archeological survey was conducted on National Forest lands. A single site designated AR-03-04-06-122 was located and recorded. Exact locational information is available from the Forest Service for legitimate researchers.

The site is situated on the end of a small hill overlooking Grasshopper Flats, west of Sedona, Arizona. The artifacts were scattered over the surface of an area approximately 75 x 100 feet and consisted of lithic tools and debris as well as small pieces of broken sherd. Vegetation consists of pinyon pine, broadleaf yucca, and manzanita, with low vegetation density. The site opens to the southeast with a slope of about 2% directly on the site but increasing to over 75% a few yards away where the hill drops off. There are no major water resources in the vicinity of the site. Elevation is about 4,480 feet.

The Artifacts

The following list of specimens were removed from the surface of the site. They have been processed, cataloged, and studied in the USFS Archeological Laboratory, Region 3, and are on permanent deposit with the Museum of Northern Arizona.

Lithic Specimens

	N	% of Total
Nontools		
Waste	361	67.86
Nonutilized flakes	47	8.83
Cores	40	7.52
Subtotal	448	84.21
Tools		
Utilized flakes	73	13.72
Hammerstones	6	1.13
Bifaces	2	.38
Retouched scraper	1	.19
Point	1	.19
Mano fragment	1	.19
Subtotal	84	15.80
TOTAL	532	100.01

Waste. Specimens in this category consist of all materials except cores and nonutilized flakes which show no evidence of use nor retouch. There is a lot of variety in size and shape, and most specimens are thought to result from the manufacture of tools. Of the 361 specimens in this category, eight are of basalt and may be portions of broken manos. There are nine pieces of quartzite and 344 of chalcedony.

Nonutilized flakes. Specimens in this category are characterized by the presence of a definite bulb of percussion and little or no exterior cortex. They appear to be no different from utilized flakes except that they show no evidence of use or wear. They were either rejected as tools or were simply not yet used. There are three quartzite and 44 chalcedony specimens in this category.

Cores. The 40 core specimens are all of chalcedony and have one or more obvious striking platforms and flake removal scars. One of the better specimens is illustrated in figure 2, B.

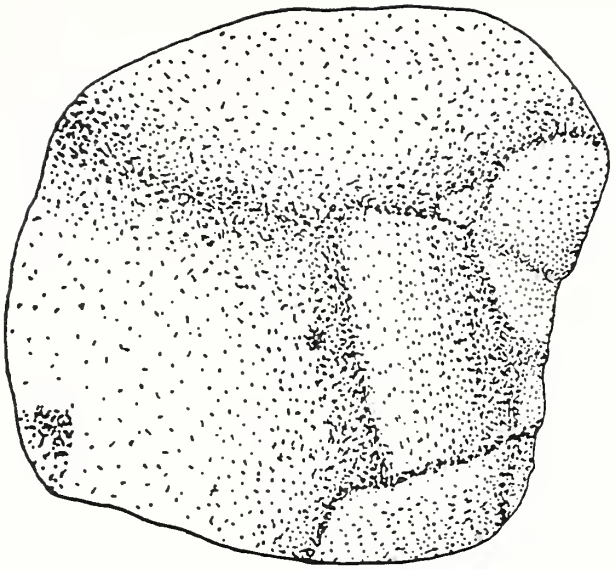
Utilized flakes. These specimens are all flakes with obvious bulbs of percussion and use scars. A single obsidian specimen (figure 2, D) was found along with 56 chalcedony (figure 2, E) and 16 quartzite specimens (figure 2, A).

Hammerstones. These specimens are cobbles with battering marks and sometimes a few flakes removed from one or more edges (figure 1, A). Three of the specimens are of quartzite, and the other three are chalcedony.

Bifaces. These specimens are flakes which have alternate edge dressing by percussion technique (figure 2, C).

Point. This specimen is the tip of a projectile which has pressure retouched edges (figure 2, F). It measures 2.1 centimeters long from tip to broken end and 1.8 centimeters wide at the broken end. The specimen is .4 centimeter thick, and is made from a light brown chalcedony.

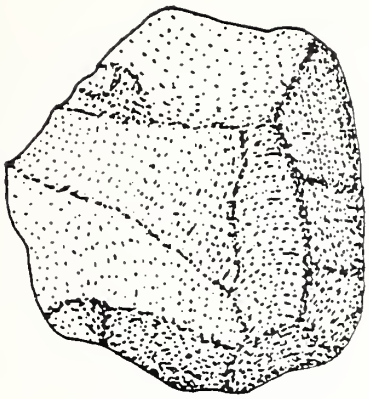
Mano fragment. The single basalt mano fragment (figure 2, B) is very porous but shows surface wear on one side.



A

B

Figure 1 - A. Hammerstone; B. Basalt Mano fragment.
All specimens are reproduced actual size.



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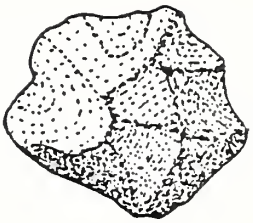

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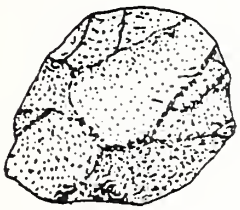

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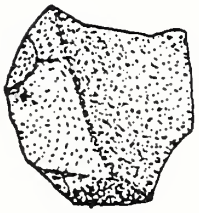


D

E

F

Figure 2 - A. Quartzite utilized flake; B. Core; C. Biface; D. Obsidian flake; E. Chalcedony flake with retouched upper edge; F. Point fragment. All specimens are reproduced actual size.

Ceramic Specimens

A total of 88 body sherds were recovered, none of which exceeded 3.5 centimeters in diameter. No rims were present, and none of the sherds were decorated. We shall not attempt a typological identification but simply describe the attributes of categories into which the 88 sherds were sorted based on color, surface finish, and temper. Color designations are after Munsell Soil Color Charts.

White Ware (10YR 8/3) (four sherds)

Plain, unslipped, unpolished, abundant quartz temper which shows on both interior and exterior surfaces.

Buff Ware (7.5YR 6/6) (84 sherds)

Thirty-one sherds have smoothed, but not polished, exterior surfaces with a thin red (10R 4/4) wash applied. Temper is quartz sand which does not show on the exterior surface but usually does on the interior surface.

Forty-two sherds have smoothed exterior surfaces but no wash. Quartz temper shows on both interior and exterior surfaces.

Eleven sherds with smoothed, but not polished, interior and exterior surfaces. Augite (possibly hornblende) and quartz temper shows on both surfaces.

At least four vessels are represented by this collection. As the site is a gathering station, we assume the vessels were brought to the site. Tempering materials used in the manufacture are from at least two locations--one containing quartz sand and the other quartz sand with abundant accompanying augite. The specimens are too small to give clues to vessel form.

PAPER NUMBER FIVE

SURFACE ARTIFACTS FROM TWO SITES ON THE SEDONA RANGER DISTRICT
Coconino National Forest, Arizona

BY
Dee F. Green

Introduction

Archeological survey has been conducted on 40 acres of National Forest land on the Sedona Ranger District, Coconino National Forest. The survey was part of a proposed land exchange and resulted in the discovery and recording of two surface limited activity sites (AR-03-04-06-120 and -121). The writer wishes to thank Ray Robley, formerly of the Sedona Ranger District staff, for assisting in the survey, site recording, and artifact collecting. Data on site location is available from the Forest Service to legitimate researchers.

Site AR-03-04-06-120

This site is located on a small rock outcrop southeast of Big Park, Yavapai County, Arizona. There is scattered pinyon-juniper and scrub oak on a slope of about 4 percent. The site is exposed to the east at an elevation of 4,800 feet and extends for about 500 square meters with a low artifact density. There is some slight surface erosion and a large mortar hole in the bedrock. All the artifacts were removed from the site and consist of lithic materials and a single sherd.

This site carries the designation NA 12572 in the Museum of Northern Arizona records.

Artifacts. All ceramic temper identifications were performed using a binocular microscope. Color designations follow Munsell Soil Color Charts. None of the ceramics are typed. Rather, they are grouped according to the attributes color, surface finish, and temper.

> Ceramic specimen. A single black-on-white sherd was found on this site. It has a grey (10YR 6/1) paste with quartz temper. The sherd is slipped (10YR 8/1) with a black (5Y 4/1) mineral paint placed over the slip. Decoration is on the outside of the vessel. The interior surface is wiped, and the vessel wall is 7 millimeters thick.

Lithic Specimens

	N	% of Total
Nontools		
Waste	76	61.78
Nonutilized flakes	20	16.26
Cores	17	13.82
Subtotal	113	91.86
Tools		
Utilized flakes	9	7.31
Mano	1	.81
Subtotal	10	8.12
Total	123	99.98

Waste. Specimens in this category consist of all materials except cores and nonutilized flakes which show no evidence of use nor retouch. There is a lot of variety in size and shape, and most specimens are thought to result from the manufacture of tools. Of the 76 specimens in this category, one is basalt; and there are 75 pieces of chert, most with abundant cortex.

Nonutilized flakes. Specimens in this category are characterized by the presence of a definite bulb of percussion and little or no exterior cortex. They appear to be no different from utilized flakes except that they show no evidence of use or wear. They were either rejected as tools or were simply not yet used. There are one quartzite and 19 chert specimens in this category.

Cores. The 17 core specimens are all of chert and have one or more obvious striking platform and flake removal scars.

Utilized flakes. These specimens are all flakes with obvious bulbs of percussion and use scars. All are chert.

Mano. A single ground stone tool was recovered, a mano (preform), which shows only very slight use on one surface. The ends and sides, however, have prominent pecking marks. The specimen measures 181 centimeters long, 65 centimeters wide, and 47 centimeters high.

Site AR-03-04-06-121

This site is located about 200 meters south of site 120 on the same rock outcrop. There is an hiatus in artifact distribution between the two sites. Vegetation is a very open pinyon-juniper woodland with scrub oak and some opuntia. The exposure is east with an elevation of 4,800 feet and a slope of 4 percent. This site has also undergone some slight erosion with about 50% bedrock exposed. Both lithic and ceramic artifacts were completely collected from the surface. This site carries the designation NA 12573 in the Museum of Northern Arizona records.

Artifacts. Definitions of lithic materials are identical to those for site 120. Again, a binocular microscope and Munsell Soil Color Charts were used in the ceramic analysis.

Ceramic specimens. Two black-on-white body sherds with the decoration in the interior surface were recovered. Neither are slipped, the black (2.5Y 3/0) mineral paint being applied directly to the smoothed surface. Both sherds have a quartz tempered white (2.5Y 7/0) paste with a grey (7.5 YR 4/0) carbon streak through the center. Exterior surface colors are white (7.5YR 8/0) and one with a grey/blue cast (10YR 7/1). The vessel walls both measure 6 millimeters thick. The sherds appear to be from different but similar vessels.

Lithic Specimens

	N	% of Total
Nontools		
Waste	82	68.33
Nonutilized flakes	21	17.50
Cores	7	5.83
Subtotal	110	91.66
Tools		
Utilized flakes	8	6.66
Point	1	.83
Mano	1	.83
Subtotal	10	8.32
Total	120	99.98

All of the specimens are of chert, except the mano which is basalt, two very small obsidian, and three quartzite unutilized flakes, and four quartzite waste products. Three of the utilized flakes are rather large, one of which is illustrated in figure 1, c. The point is illustrated in figure 1, a; and the mano is figure 2, a.

Miscellaneous Specimens

In addition to the two sites, there was a scattering of artifacts spread thinly over the 40-acre tract. These are summarized below in the same categories already defined and utilizing the same analytical techniques.

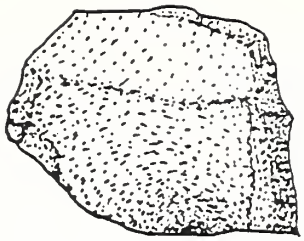
Ceramic Specimens. One black-on-white sherd and one small white sherd, possibly from a different black-on-white vessel, were found along with four buff sherds from two vessels. The black-on-white sherd is quartz tempered with a light grey/white (10YR 7/1) paste and unslipped surface. The black is faded, so no color comparison was made. The vessel wall is 3 millimeters thick; and the decoration appears on the inside surface which, along with the outside, is well smoothed. Carbon streak is absent. The other white sherd has a quartz temper and a dark (2.5YR 3/0) paste. The surfaces are not well smoothed, and the temper shows through. The vessel wall is 5 millimeters thick.

The buff sherds are all of the same general color (10YR 6/4), both surface and paste; and all have quartz and augite temper. However, two of the sherds have vessel walls 5 millimeters thick, and the quartz temper is more apparent on both surfaces. The other two sherds have walls 7 millimeters thick with less prominent temper. One of these latter shows a slight polish on the exterior surface.

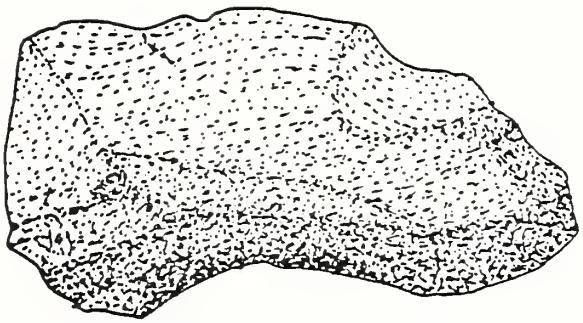
Lithic Specimens

	N	% of Total
Nontools		
Waste	120	71.01
Nonutilized	23	13.61
Cores	8	4.73
Subtotal	151	89.35
Tools		
Utilized flakes	14	8.28
Biface	1	.59
Mano fragments	3	1.77
Subtotal	18	10.64
Total	169	99.99

a.



b.



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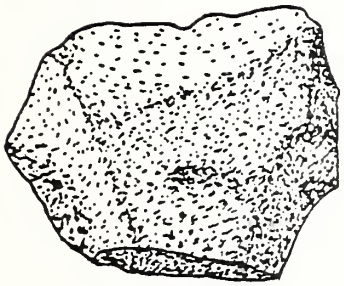

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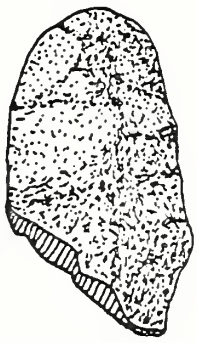

e.

Figure 1 - a. Point; b. and c. Utilized flakes from Site 121; d. Utilized flake ; e. Bifacially percussion flaked implement both from miscellaneous surface. All specimens drawn actual size.

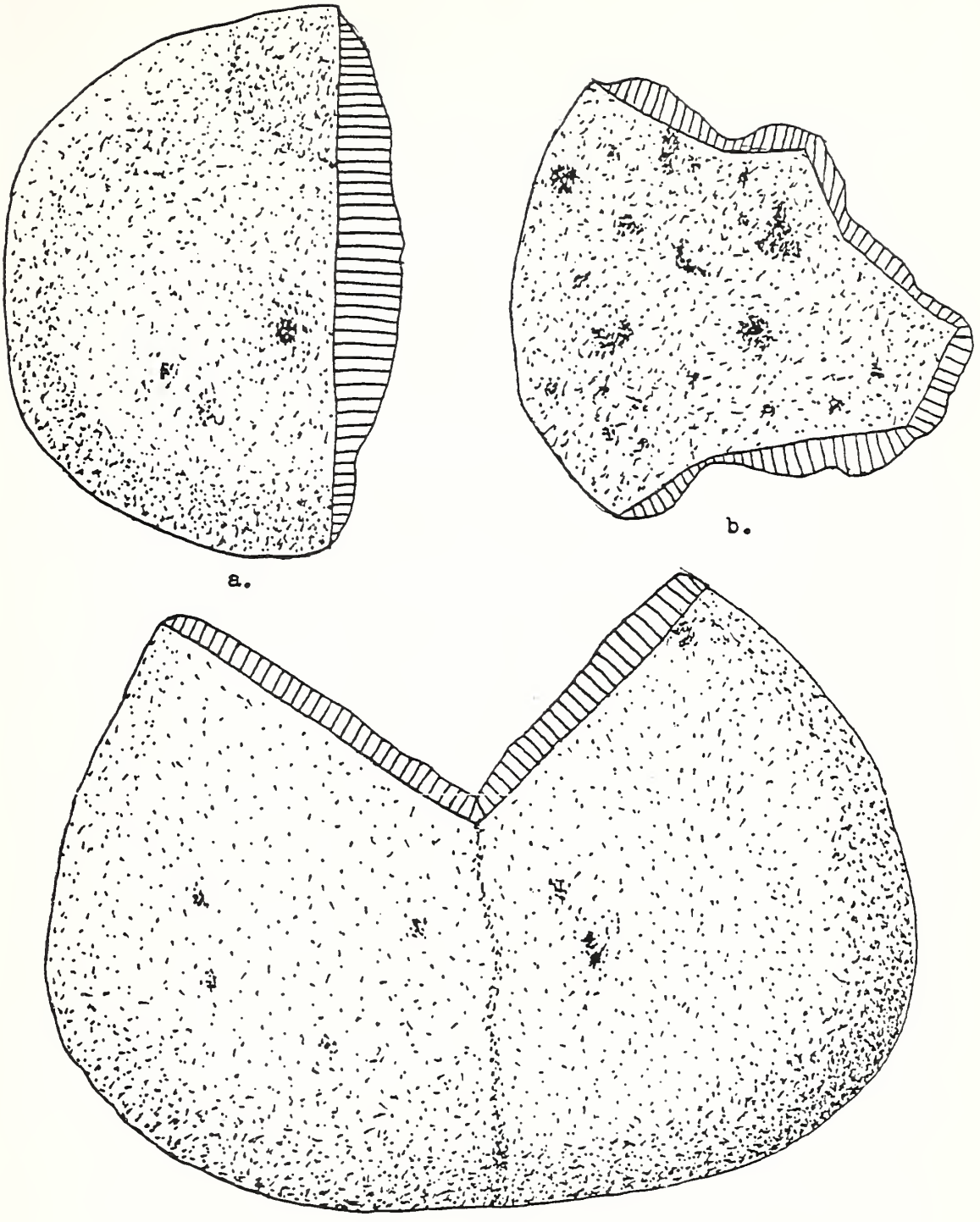

Figure 2 - Mano fragments, a. Site 122; b.and c. Miscellaneous surface finds. All specimens drawn actual size.

All of the lithic specimens are of chert except the manos which are basalt.

Summary

Total specimens by category for the two sites and the miscellaneous surfaces are:

Ceramic Specimens

White Wares - Five specimens representing five vessels.
Buff Wares - Four specimens representing two vessels.

Lithic Specimens

	N	% of Total
Nontools		
Waste	278	67.47
Nonutilized flakes	64	15.53
Cores	32	7.77
Subtotal	374	90.77
Tools		
Utilized flakes	31	7.52
Point	1	.24
Biface	1	.24
Manos	5	1.21
Subtotal	38	9.21
Total	412	99.98

Based on the quantity of nontool artifacts and the abundance of cortex on the waste and nonutilized flakes, Big Park seems to have been a tool manufacturing station. Some gathering probably took place as well.

PAPER NUMBER SIX

LOCATING ARCHEOLOGICAL SITES USING AN INFRARED THERMAL LINE SCANNER

BY
Dee F. Green and Michael J. Lunt

Introduction

As a part of its fire suppression equipment, the United States Forest Service utilizes an aircraft equipped with an infrared thermal line scanner. Unlike an infrared photograph which utilizes the sun's reflected energy to form an image, an infrared thermal scanner measures the actual temperature emitted by objects on the ground. This makes possible the detection of objects during the night, an application used by the military in Vietnam; or under dense clouds of smoke, the use made of the technique by the Forest Service.

A photograph recording in the visible portion of the electromagnetic spectrum is recording only surface qualities of the sun's reflected energy. An infrared scanner is recording the temperature differences not otherwise visible to the human eye or detectable in the visible portion of the spectrum. The theoretical notion behind this idea is that all objects above absolute zero (-273° C) emit radiation due to intermolecular action. The infrared scanner can sense differences or variations in the emitted radiation and then convert it to an electrical signal. The electrical impulse then regulates a light system which exposes the information on film or the impulse may be recorded on magnetic tape and played back over a video receiver. Thus, the image is a visual means for showing temperature differences between objects, provided they, in fact, have different emitted radiation.

Since infrared scanning records actual temperature rather than reflected energy, it might be possible to locate some kinds of archeological sites provided they have temperatures different than the immediately surrounding landscape. Since differences as small as $\frac{1}{2}^{o}$ can sometimes be detected, the technique holds promise for location of some kinds of sites. For example, if the plastered floors of buried rooms, pit houses, or kivas retain water, there might be a temperature difference on the surface. Temperatures of rock should be different than that of surrounding soil, thus outlining rooms. Trash dumps with ash and other debris might have different temperatures than surrounding areas. Since the Southwestern Region of the Forest Service has over 20 million acres of land on which archeological survey is needed, it was decided to employ an infrared scanner on a test basis to see if it could be used to locate sites.

In connection with the Forest Service project, we cooperated with the Chaco Center National Park Service and with the Puerco Project

of Dr. Cynthia Irwin-Williams and flew infrared scan missions for them at the same time our own was flown. The results of their scans will be left for presentation by Dr. Irwin-Williams and Dr. Tom Lyons of the Chaco Center.

We express appreciation to Mr. John T. Koen, Director of Recreation, and Mr. Walter E. Furen, Regional Engineer, both of the Southwestern Region, U.S. Forest Service, for their support in this study.

Project Design

There are several variables which might affect the ability of an infrared scanner to detect an archeological site with any greater precision than photography. For example, altitude at which the scanner is operating, line resolution in the instrumentation, the kinds of ground cover on the archeological sites, etc. Theoretically, whether the mission is flown by day or night should make no difference since heat, not reflected solar energy, is being detected.

Because of the above variables, we have designed the experiment to control in some measure for elevation, instrumentation, and cover. Initially, we anticipated that large sites with structures such as 100+ room pueblos with little vegetation cover should be detectable. We had no idea whether smaller pueblo sites would show in the imagery nor what effect vegetation would have. We, therefore, wanted to control for elevation in order to test resolution of the imagery and see if lower elevation flights would produce more definable images of the sites. Also, we were interested in seeing if sites buried under alluvial soils and obscured by different vegetation types could be discovered.

We began by selecting two large known pueblos located in different topographic contexts as our first test areas. It was felt that if these indeed were visible on the imagery, then perhaps smaller sites in their vicinity might also be visible and could be ground checked. The two pueblos selected for testing were Pueblo Colorado, a large site occupied into Spanish Colonial times located on a mesa top with sparse pinyon-juniper vegetation, and Gallinas Springs, another multi-room, multi-story pueblo located along side a stream in a small canyon with rocky outcrops and transitional vegetation between pinyon-juniper and ponderosa

forests. Both are located on the Cibola National Forest, New Mexico. Both were flown at different elevations and with different equipment as reported below. We do not yet have reportable results on other vegetation types nor on buried sites.

Equipment

To date, two tests have been carried out using different aircraft and scanning equipment. The first test was made using a Beechcraft "King Air" aircraft owned by the U.S. Forest Service and equipped with a modified EMR Schlumberger Infrared Line Scanner with two detectors (see figure 1). The first detector is Indium antimonide (InSb) and the second, Mercury-doped germanium (Ge:Hg). This scanner produces, at near real time, a 5-inch wide continuous strip negative on a film base using a wet chemical system in the 8-14 micron range (Ge:Hg). The imagery is rectilinearized, and the aircraft is also equipped with a Sabre III, 14 channel, wide band, video tape recorder that handles up to 60 inches per second. A monitor in the aircraft permits adjustment of the imagery.

The second test was performed by a military aircraft using a declassified Singer line scanner with a dual channel three detector (AAS-14/A) system (4 milliradian). This system is capable of resolving a 2-foot by 2-foot target at 500 feet over the terrain.

Results of Test I

This mission was flown using the Forest Service aircraft and equipment detailed above during December of 1974. Both sites were flown at approximately 35,000 feet above the terrain. The scans produced on this flight show both sites, but details are no clearer, and perhaps less clear, than good black-and-white photographic imagery. To date, we have not been able to locate any smaller sites on the scans. Snow cover on some of the Gallinas Springs terrain, particularly on north slopes, has added to the locational problems. The area around Pueblo Blanco, however, is relatively snow free, and several anomalies show which have not yet been ground checked. Resolution at this altitude is good, and many modern features such as roads and powerlines show well. There are occasional areas on a scan strip which have line distortion due to thermal bumps; but, for the most part, the results are very good insofar as the production of the scan itself is concerned.

INFRARED SCANNER SURVEILLANCE SYSTEM

(VLIR-VERTICAL INFRARED)

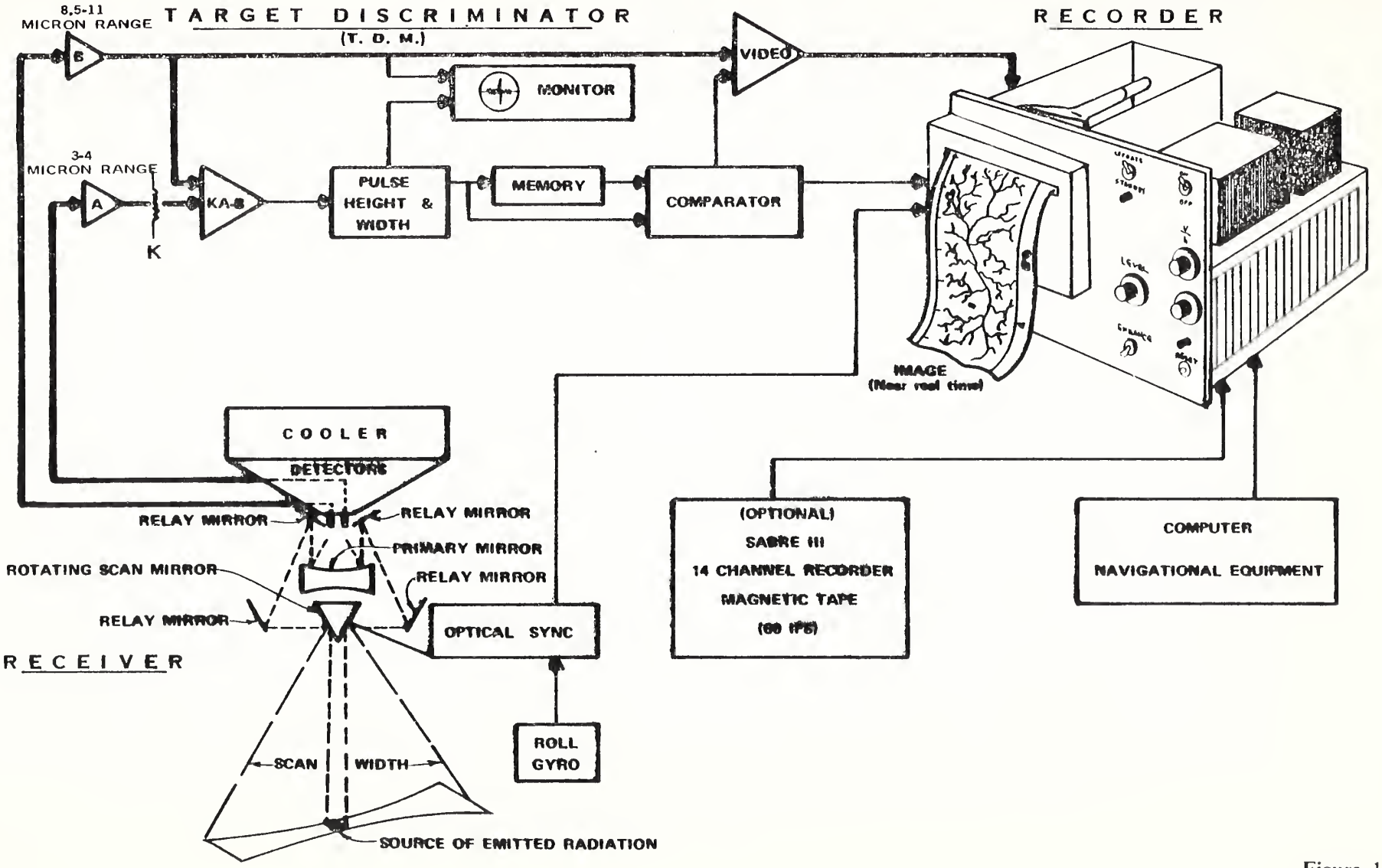

Figure 1

Despite the fact that the large sites show no better on the scan than on photography, we have observed a number of interesting patterns on the scans which do not show on Forest Service resource photography. These anomalies do not appear to be natural, but remain to be ground checked. Our preliminary assessment of this test is that large pueblo masonry sites are detectable and others may be.

Results of Test II

The second mission was flown by the military aircraft equipped as detailed above during the fall of 1975. Both sites were flown at approximately 540 feet above the terrain.

Unfortunately, the military aircraft missed their target at Pueblo Blanco, and the site does not appear on the scan strip. They had better luck at Gallinas Springs, and the site area shows clearly. However, resolution of the scan is poor. Some of the test pits placed in the site during the summer by Western Michigan University show on the scan but are very indistinct and fuzzy. At this point, we are not sure whether the poor resolution of this low-level test was due to poor operation of the equipment or whether it is simply beyond the capabilities of current declassified technology. Again, more ground checking of various anomalies which show on the scan needs to be conducted.

Conclusions

The experiment so far has demonstrated that large pueblo sites can be located using an infrared thermal scanner. However, we will need to do additional testing to resolve the following problems.

1. Is there an optimal altitude for infrared scan to detect sites, or will flights at different altitudes be necessary?

2. Can the poor resolution at low altitudes be resolved?

3. Are there kinds of sites which are detectable using infrared scanning which do not show on photography?

4. Can sites which have heavy vegetation cover be detected and, if so, under which kinds of vegetation?

5. Might it be possible, in some cases, to detect sites which have been buried and do not show on the ground surface?

6. Are there any other variables affecting the ability of the technique to locate sites which need to be controlled?

These questions we hope to answer as the project continues.

PAPER NUMBER SEVEN

AN ANALYSIS OF LITHIC REMAINS FROM THE MT. TAYLOR DISTRICT
Cibola National Forest, New Mexico

BY
Roy Doty

Introduction

This report is written in conjunction with an archeological clearance investigation (Smith, 1975). It contains the analysis of artifacts collected from site AR-03-03-2-25 on the Cibola National Forest, Mt. Taylor Ranger District, New Mexico.

In the course of the project, 200 acres of land were surveyed to determine the presence of cultural resources. A systematic sampling method was designed to survey 100 percent of the acreage. This was carried out on foot as mentioned in Smith's report.

The writer wishes to thank W. James Judge and Landon D. Smith for many useful suggestions in the analysis. Drawings are by the author.

Site Locality

Site AR-03-03-2-25 is situated at an elevation of 8,100 feet in an Arizona pine forest environment. It is located on the ridge of a knoll on a locally occurring limestone exposure, overlooking a large valley. Also in the vicinity is an abundance of stone resources, including chert and chalcedony. Water resources are visible 2,000 yards below the site. Soil cover is mostly colluvial and vegetation. On the site is blue grama grass, ponderosa pine, rabbitbrush, and pinyon.

The site itself consists of a small scatter of lithic materials; 12 specimens were found in an area 30 meters square. No ceramic or faunal remains were discovered, nor habitation structures.

Analysis

The surface collection, as noted, produced a total of 12 lithic specimens, including tools and debitage. The most utilized material was chert (8 specimens); four were obsidian.

After drawing each specimen, all were closely examined for traces of wear and use and traces of manufacture by using a 10x variable Feiss microscope. Close examination for traces of wear may

enable one to define what work was done with a given tool. They play a decisive part in the study of tool preparation, such as percussion, flaking, retouch, grinding and sawing (Crabtree, 1972; Semenov, 1973).

This analysis showed 11 of the 12 specimens had retouch and other signs of modification (see table 1). Specimen 001 displayed no signs of alteration, although it does have a bulb of percussion. Specimens 002 and 003 are retouched on both ventral and dorsal sides. Step fractures and hinging are present. Both pieces are broken tools.

Specimen 004 has retouch and step fracture on its right lateral edge. Pressure removal of flakes is evident by the deep, hinged fractures.

Specimen 005 is a broken, side-notched point. Retouch is present on the left notch and distal end. A hinge fracture severed the point.

Specimen 006 is a modified flake with retouch on both lateral edges and proximal end. A crushed modified platform and lip presence is diagnostic of indirect percussion.

Specimen 007 exhibits retouch on its left lateral edges. Attrition and polish presence indicates its utilization as a scraper.

Specimen 008 has retouch on both lateral edges and proximal and distal ends. The presence of crushed, modified platform and lip indicates the flake was removed by indirect percussion. Polish and some attrition indicate its use as a scraper.

Specimen 009 is a broken side-notched point. Retouch is present on both proximal and distal ends. The right lateral edge and notch are also retouched. Flake scars are present on both dorsal and ventral sides.

Specimen 010 exhibits signs of retouch and polish on its right lateral edge. A crushed, lipped platform indicates the flake was removed by indirect percussion. Its utilization was for scraping.

Specimen 012 is a spokeshave. Retouch, step fracture and polish are all present in the lower right concavity. Heavy attrition in this region indicates prolonged utilization of this specimen.

Table 1 - Lithic Specimens from AR-03-03-2-25

Artifact Number	Platform Width (MM)	Platform Length (MM)	Platform Condition	Flake Width (MM)	Flake Length (MM)	Bulb	Bulb Thickness (MM)	Maximum Thickness of Flake at Middle (MM)	Termination Condition	Striations	Ondulations	Description of Piece	Retouched	Material
001									Hinge			Unmod.		Chert
002	2.0	5.0	Present	8.0	16.0	Yes	3.0	3.0	Hinge			Broken tool	Yes	Obsidian
003			Absent	8.0	14.0	No		5.0	Hinge			Broken tool	Yes	Obsidian
004				12.0	31.0			9.0				Scraper	Yes	Chert
005				21.0	21.0			5.5		Yes	Yes	Broken point	Yes	Chert
006	5.0	21.0	Crushed	6.0	12.0	Yes	4.0	3.0	Hinge	Yes	Yes	Mod. flake	Yes	Obsidian
007			Absent	13.0	34.0			7.0	Hinge			Mod. flake	Yes	Chert
008	3.0	2.0	Crushed	18.0	35.0	Yes	3.0	2.5	Feathered	Yes	Yes	Scraper	Yes	Chert
009				22.0	30.0			4.0	Hinge	Yes	Yes	Broken point	Yes	Chert
010	2.0	39.0	Crushed	4.0	55.0	Yes	5.0	7.0	Feathered	Yes	Yes	Scraper	Yes	Chert
011			Absent	25.0	30.0			18.0		Yes	Yes	Core	Yes	Chert
012				15.0	50.0			15.0		Yes	Yes	Spokeshave	Yes	Chert

Conclusions

The absence of diagnostic artifacts at this site prevents temporal placement. The kinds and low numbers of artifacts, along with the environmental setting, suggest that the tools were used in hunting activities. We are presently unable to suggest wider or more detailed interpretations.

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001

002

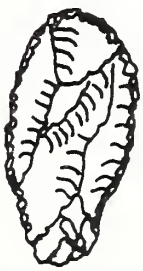
003

004

005

006

007



008

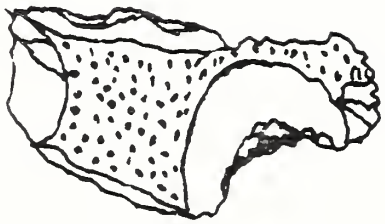
009

1"=1" SCALE

Figure 1

O10

O11



O12

Figure 2

PAPER NUMBER EIGHT

A ROAD AND DRILL PAD SURVEY FOR THE QUESTA MOLYBDENUM COMPANY
Carson National Forest, New Mexico

BY
Curtis Schaafsma

Introduction

The Questa Molybdenum Company is planning to construct several drill sites and related drill site access roads in the vicinity of the Molycorp Mine. The proposed construction area is approximately $3\frac{1}{2}$ miles northeast of the existing mine plant on the Carson National Forest, New Mexico. The roads are at the base and crest of a high ridge; the three upper roads are all over 9,800 feet and generally are over 10,000 feet elevation. In accordance with Federal legislation requiring the protection of archeological resources on Federal lands, the Forest Service required that the areas of proposed land alteration be surveyed archeologically. Mr. Gordon Lister, project planner for Questa Molybdenum, contacted the School of American Research on October 14, 1975, and requested us to perform the necessary archeological clearance survey. Arrangements were made, and the field work was accomplished by the writer on October 17, 1975. Mr. Steve Soderman, geologist with Questa Molybdenum, assisted with the survey. For descriptive purposes, the roads have been given letter designations that correspond with the order in which they were surveyed.

As a general summary, no archeological remains of any type were observed on roads A, C, and D; and there were no indications that the proposed construction would indirectly affect any archeological resources. A single flake tool (figure 1) was found on road B. No other archeological remains were observed in the vicinity. The artifact is directly in the proposed road area. While there is no reason to recommend that the road be relocated to avoid a single artifact, it was appropriate to collect the tool, given the paucity of recorded artifacts from high mountain environments in Taos County. For example, I am not aware of any recorded artifacts from this elevation or higher in the entire Sangre de Cristo Range from southern Taos County to the Colorado border.

In the following discussion, each road is described separately; the artifact is described; and a general archeological summary of the immediate area is offered on the basis of this limited survey work.

Road A

This road begins at the paved highway to Red River at an elevation of about 8,500 feet and winds up the north side of the valley to nearly 9,000 feet. For about half the distance, it follows an

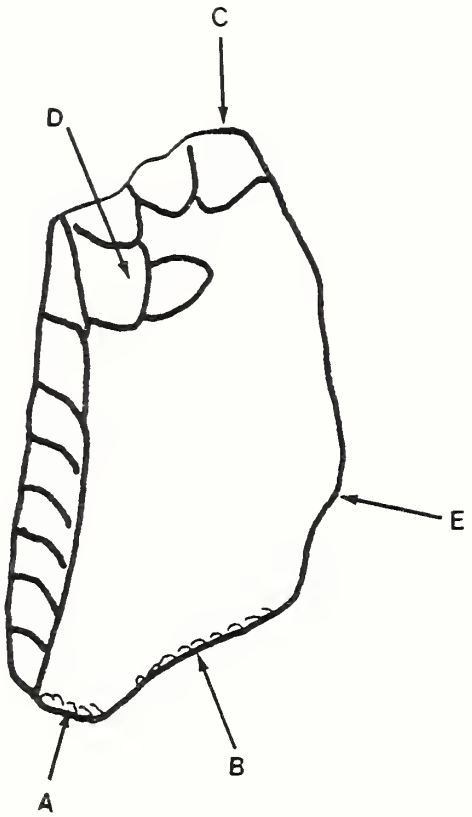


Figure 1 - Flake tool "Moly #1," actual size.
See text for description of points A-E.

existing road; the northern portion will be a new road. The lower part of the existing road follows an alluvial fan that has a dense tree cover; this was not walked, but was driven over and observed from the vehicle. The upper portion is on a loose landslide that appears to be recent, although there are numerous trees on it. No archeological indications were seen in this unstable area.

Road B

This road begins in the high saddle overlooking a very eroded valley to the east, with a wooded slope to the west. The elevation is 10,400 feet. From the saddle, the road stays on the steep western slope of the ridge to a ridge on the south side. It then turns toward the east and switchbacks near the edge of the canyon to return west to the drill site on the ridge, at an elevation of 10,000 feet. In surveying this road, Soderman walked the flagged route on the steep west slope while I walked the ridge crest above. Beyond the southern ridge we both followed the road route and we both followed the flagged route on the return.

The flake (designated "Moly #1") was found on the upper part of the switchback at an elevation of about 10,080 feet. It was 36 feet west of the flag at the end of the switchback and 60 feet west of the edge of the canyon that begins just beyond the turn. The slope is steep and about 25 degrees. It faces south and overlooks the Red River Valley that is about 1,500 vertical feet below. The slope is quite open and bare, probably due to the southern exposure. There is very little brush or grass. The trees are mostly small Douglas fir with a few white pine and an occasional Quaking aspen. The nearest water is apparently in the Red River. The situation and nature of the tool argue that this was a hunting locality and there were no camps in the immediate area.

Road C

This road begins in another saddle on the same general ridge as road B at an elevation of about 10,300 feet. The road follows through a deep woods on the north slope of the ridge to a switchback about 1,500 feet to the northeast, where it swings sharply back along the same slope to the west to the drill site at approximately 10,500 feet. The ground is covered with a dense carpet of moss and lichens which

generally obscures archeological observations. However, there were no indications of archeological remains, and every available bare area was examined. The road was walked once by Soderman and the writer.

Road D

Road D begins on the north slope of the large southwest-northeast trending ridge in this area, follows an existing road for a short distance, and goes up to a wide, fairly open ridge at an elevation of about 10,200 feet. It then winds with a series of switchbacks down the south slope to a drill site at 9,600 feet. The lower and western portion of this road and the drill site itself are in a very steep, loose, eroded area. In addition to the main road, a spur road to the canyon rim was examined.

Flake Moly #1

The tool is made of fine-grained basalt with small phenocrysts of olivine (?). It is clearly an intrusive material type (as confirmed by Steve Soderman) and would have to have been carried to this location from at least as far as Questa, the nearest source of fine-grained basalt.

A. Bifacial, light attrition wear marks on the distal end indicate usage as an end knife for cutting light materials such as hides and meat.

B. Unifacial, light chipping wear marks on the right lateral edge indicate usage as a scraper for light tasks such as cleaning and dressing hides. This edge is gently concave. Both A and B are low edge angles.

C. The striking platform and bulb of percussion are clear as are the striations on the ventral flake side.

D. There are small flake scars on the dorsal side.

E. The coarse, irregular chips on the right lateral edge above the scraper wear may be from use as a knife.

The size and wear patterns of the tool are consistent with an interpretation of its use in butchering and field cleaning game such as deer, elk, and mountain sheep, which can be found in the area.

The age of the tool is undetermined at this time; but, since the dominant artifacts associated with high mountain sites in the Truchas Peaks area (Wendorf and Miller, 1959) relate to the Archaic Period of about 1500 B. C. to A.D. 400, it is reasonable to suggest that this tool would relate to the pre-Pueblo Archaic Period. The existence of Archaic sites along the Rio Grande gorge was long ago documented by Renaud (1942), and the writer has recently presented additional evidence for an Archaic Period occupation of Taos County (Schaafsma, 1975). As Wendorf and Miller discussed the high mountain sites in the Truchas Peaks area, such sites can be seen to relate to former subsistence-settlement cycles which would have included the high mountain resource area as a necessary and integral component of the seasonal round. This pattern of seasonal utilization of the high mountain resource area has been discussed in depth as it existed in modern times among the Paiutes in Owens Valley, California (Davis, 1963). The artifact is housed with the collections of the School of American Research, Santa Fe.

Projections Made on the Basis of this Survey

The four access roads described above amount to four transect surveys providing some idea of the archeological situation in the area. The two roads (A and D) which enter or cross the steep, eroded areas allowed these areas to be examined. They are so unstable and steep that the presence of sites or single artifacts is extremely unlikely. The stable, wooded slopes on the south slopes, as on roads B and D, contain occasional isolated artifacts (as shown by the flake from Moly #1); but campsites would not be expected. The north slopes, such as in road C, could contain isolated artifacts; but the ground is obscured by moss and lichens making observations difficult. Again, due to the steep slope, campsites are not expected. The ridges in the area would presumably be the best places to expect sites, and any future work in the area should examine them fully. The one flat ridge we surveyed is the ridge crossed by road D. At this point, very little is known about the situation of high altitude sites; what is known suggests that the primary site locations are in the tundra between 11,000 and 11,500 feet (Wendorf and Miller, 1959; Husted, 1965).

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PAPER NUMBER NINE

A PRELIMINARY ANALYSIS OF THREE SAMPLE SURVEYS IN THE GOLONDRINO MESA AREA

Santa Fe National Forest, New Mexico

BY
Landon D. Smith and Herbert W. Dick

Introduction

During 1975, three separate surveys were conducted on the Santa Fe National Forest, Cuba Ranger District, in contiguous areas on Golondrino Mesa. Two of the surveys were done by Forest Service archeologists, and one was done by an archeologist working at a permitted institution. All three surveys were similar in that none of them represented a complete survey in the traditional sense; all are samples, albeit, at different intensities.

Because of the amount of archeological information that these surveys provided for a relatively large piece of land (approximately 10,000 acres), it was decided to synthesize the three separate reports into one and to present some limited archeological interpretation. It is felt that, by so doing, a body of rather valuable raw data would be made more available than it would have been if left in the three smaller reports of rather limited distribution. But more importantly, in addition to the archeological information, the reader will also find some data on statistically oriented sample survey, an area of growing importance to the Forest Service in particular and archeology in general.

Surveying Methods - General Considerations

Responding to the impetus of Executive Order 11593, which drew attention to the agency responsibility inherent in a long series of public laws concerning the preservation of cultural resources, the Southwestern Region, U.S. Forest Service, has increased dramatically the archeological survey of lands impacted by in-house projects. The great majority of projects involve relatively limited areas, usually having sizes less than 600 acres (cf. Green et al., 1974). Since these represent manageable sizes, given the requirements of time, manpower, and money, it is possible to normally conduct the survey on 100 percent of the land in the project area with a few men in 1 to 8 days.

The growing awareness and sensitivity to the importance of providing protection for archeological materials on the part of all Forest Service personnel is, in part, responsible for a steadily increasing number of requests for archeological clearance investigations. In addition to this increase in number of requests has been noted a shift in the type of projects for which archeological input of one

sort or another is sought. Most notable has been the desire for archeological surveys on timber sales and for land use plans. A major characteristic that distinguishes these projects from most others is their sheer size. Timber sales can comprise from 1,000 to 8,000 acres or more. Land use plans may involve up to 70,000 acres or more.

Forest Service archeologists have been suddenly forced to make some rather basic decisions in order to deal with these larger projects. Ignoring them is out of the question. Conducting 100 percent surveys requires expenditures of time, people, and money that could force the price of timber up and make such a demand on the time of the few Forest Service archeologists that virtually nothing else would get done.

It is perhaps obvious that the single factor that contributes most to this quandary is that space is surveyed for archeological/cultural material. Densities of cultural remains are variable; but, even at their most concentrated levels, the surveyors often must look at much more space that is devoid of remains than space where such remains are in evidence. Archeologists have most often not held this basic characteristic to be of importance or worthy of recognition. For this reason, many areas surveyed, but not containing sites, remain on maps as blank. No indication is even provided that sites are not present. However, it is clear that areas without sites are just as important from the land manager's point of view as areas where sites exist.

One answer to the problem of surveying large land tracts that has been voiced by a number of District personnel is that there is no sense in spending time looking at land where there are no sites anyway. They feel that this would probably be true in most areas where timber is being cut. But some level of input is necessary in order that a quantified assessment of a land parcel's archeological site density might be made prior to selling the timber. Obviously, what is needed is a method by which an area could be sampled at some low level so that it would be possible to ascertain whether sites are present or not. If they are not present, then no other work would be necessary and clearance could be accomplished with much less expenditure of time than would otherwise be required if the whole tract were surveyed. If, on the other hand, sites are present, then density estimates would be a prime consideration in determining the next course of action.

Archeologists have long recognized that it is not always possible to conduct an intensive (or 100 percent) survey of an area (Ruppé, 1966), and have employed less-than-complete survey methods almost since the inception of surveys. (We will refrain from referring to these methods as sampling since the term has a precise meaning in a statistical sense that these methods fail to meet.) These approaches may be referred to in any of a number of ways, but they are all methods that collect only part of the site locational information in a given area. Each of these approaches has a direct relationship to a particular goal or set of goals. The point at this juncture is not the efficacy of any such method, but that archeologists do constantly conduct surveys of less than 100 percent of the area (e.g., Holiday, 1974) whether they always recognize the ramifications of their methods or not.

Stochastically based sampling was first explicitly proposed as an appropriate method for archeological data recovery by Binford (1964:1972). Since that time, a series of general complaints and criticisms have been voiced by archeologists; but our purpose here is not to specifically deal with them since this is done elsewhere (Smith and Green, 1975). More important is that the general focus of criticism seems to question the applicability of probability sampling to archeological data. For the purposes of this discussion, let us merely point out that tests of probability sampling in an archeological context have been made (Chenhall, 1972, 1975; Mueller, 1974; Judge et al., 1975; Plog, 1972) and, while not numerous, they substantively demonstrate its efficacy. Only one test (Chenhall, 1972, 1975) rejects sampling as an adequate and appropriate procedure, but the grounds for this rejection appear to lack either substance or credibility (see the critical discussion in DeBloois, 1975:28ff; and Cowgill, 1975:268-9). The position archeology seems to find itself in now is one in which it is not a question of whether to "sample" or not, but, rather, whether to use stochastically sound probability sampling or not.

The decision to adopt these statistically based procedures with Forest Service projects was probably predictable, since, contrary to archeology generally, the Forest Service has a long history of the application of statistical sampling to land management (e.g., Finney, 1948; Freese, 1967; Hair, 1967; Johnson, 1943; Mesavage, 1971; Schumacher and Chapman, 1942). Above and beyond the general climate of acceptance of these methods on the part of the agency, the Region 3 archeologists involved have a background rather heavily weighted in this direction.

History and personal preference aside, however, it remains a fact that stochastically based sampling allows for the quantified evaluation of the results. From these samples, estimates of site number, density, and character are possible because the samples quantitatively represent the populations they are drawn from if the samples are drawn properly (DeBloois, 1975; Judge, et al., 1975; Mueller, 1974; and Donaldson, 1975). Nonstatistical "samples" contain unquantified and often unrecognized bias. (That is, they are nonrepresentative of the whole of which they are a part, and no measure of this departure is possible.) As a result, the characterization of an area, based on such partial information, not only must remain subjective, but is subject to unknown error. In short, from the standpoint of the land manager, these nonstatistically acquired data are almost less than useless.

Another consideration also needs to be mentioned. Timber operations represent not only large areal projects, but also varying degrees of impact. It seems apparent that differing levels or types of impact require somewhat different methods for identifying and protecting the cultural values. For example, within a timber sale area, the major impact results from road construction and improvement. But roads involve only a small part of the total area. Next in intensity of impact would be skidding areas which are much more numerous than roads. Finally, there is the impact that results from the tree cutting itself. This occurs generally everywhere in the sale area.

It is clear that road construction, because of its high potential impact on any archeological remains, requires a complete 100 percent inventory along the right-of-way so that cultural materials are located and dealt with. The impact of felling and skidding trees is related in large part to the nature of the archeology. Felling a tree on top of standing walls could be disasterous. However, if the site is--for all practical purposes--buried, felling and skidding will make virtually no difference.

Therefore, with the exception of those areas receiving major impact (that is, the roads and landing areas), and consequently requiring 100 percent systematic surveying, a general approach using statistically based sampling designs was used. Models generated from statistically valid samples have the potential of providing reliable predictions of site density, character of prehistoric utilization, time(s) of occupation, and various site location parameters (see for example, DeBloois, 1975; Donaldson,

1975; Judge, et al., 1975; Loria, 1975; Mueller, 1974; and Plog, 1972). The main reason for this results from the actual presence of patterns existing between archeological site location and a number of vegetational and environmental variables (see table 1, which is drawn from the work of the Southwestern Anthropological Research Group 1974:18).

In the case of this project, the results of samples drawn from the project area will primarily enable decisions to be made regarding protection of the cultural values. Areas of high concentration and loci of unique or important manifestations will be isolated through statistically based sampling designs. Expressed in simplest terms, if the samples drawn indicate extremely low site densities, no further work will probably be needed. If the predicted densities are moderate or high (these terms are not specifically quantified here, but we are talking of site densities of from approximately 5 to 60 or more sites per square mile), then it will be necessary to locate those sites in one manner or another to protect them.

As mentioned above, roads and landings are surveyed at 100 percent intensity. All other areas are sampled at approximately a 10 percent level using a series of randomly placed transects. A few words are in order with reference to sampling intensity; that is, the amount of space that is surveyed for the sample. Intuitively, it is evident that estimates based on a 50 percent sample would be more "accurate" than those based on a small sample. This is indeed the case. Statistical research has established, through testing and direct experiment, the parameters or distributions of various populations. Generally speaking, a number of independent samples (with and without sites) of space drawn randomly from a population of sites in a given space will show a distribution reflecting that of the population itself. This means, in practical terms, that while one sample might come up with no sites in it and another sample might have a larger number of sites in it, as more and more samples are drawn, a larger number of these samples (and the estimates of site number based on them) will cluster around a mean or average number of sites. It is interesting to note that some recent research has indicated that the mean estimate of site density based on samples tends to be higher than the actual number of sites in the population sampled (DeBloois, 1975), though this is not always the case (Judge, et al., 1975). This over-estimation is the opposite result from that which has been feared by critics of sampling in the archeological profession. What is of specific interest to us here is a quantified statement of the relationship of

Table 1

Significant Dependent Relationships by Time Period
All Research Areas

Time Period	Variables	X^2 Value	Level of Significance
1200-1300 A.D.	Site Type/Regional Land Form	3.85	0.05
	Site Type/Arable Land	4.74	0.05
	Site Size/Juniper-Pinyon	11.10	0.001
	Site Size/Sagebrushy	10.91	0.025
	Rooms/Regional Land Form	8.54	0.005
	Rooms/Rainfall	6.29	0.02
1100-1199 A.D.	Site Type/Arable Land	4.67	0.05
	Site Size/Juniper-Pinyon	7.14	0.005
	Site Size/Saltbush, Greasewood	14.53	0.001
	Site Size/Rainfall	5.07	
	Site Size/Arable Land	11.27	0.001
	Rooms/Regional Land Form	8.02	0.005
	Rooms/Domestic Water Source	4.37	0.005
1000-1099 A.D.	Site Type/Arable Land	13.15	0.05
	Site Size/Saltbush, Greasewood	4.61	0.025
900-999 A.D.	Site Type/Arable Land	14.90	0.01
	Site Size/Pine	5.26	0.025
	Site Size/Oak-Juniper	20.84	0.001
	Site Size/Arable Land	21.39	0.001
	Rooms/Arable Land	17.67	0.001
	Rooms/Rainfall	11.83	0.001
700-799 A.D.	Rooms/Domestic Water Source	12.90	0.001

the error of a sample estimate (expressed in terms of a statistical standard error and standardized coefficient of variation) to the level of sampling intensity. Once this information is known, one may then weigh the acceptable levels of "error" against the requirements of manpower, time, and money. While this issue is discussed at much greater length in a report presently in preparation (Smith and Green, 1975), a general expression of this relationship may be seen in figures 1 and 2.

A comparison of DeBloois' work with another similar regional test (Judge, et al., 1975) suggests some interesting considerations. Already noted is the over-estimation of DeBloois that did not occur in the latter analysis. Several possible explanations suggest themselves, but it will probably require a somewhat more detailed study to finally clarify this divergence. More important is the comparison of quadrat to transect sampling. It had already been suggested, on the basis of tests on nonarcheological materials, that transects provide the best estimates of the characteristics of archeological sites (Smith and Green, 1975). These tests evaluated the efficacy of quadrat and transect sampling for use with vegetation type and density (Anderson, 1942; Bauer, 1943). To summarize, it seemed apparent that with items that were nonuniformly distributed in space (as are archeological sites), quadrats show a tendency to either over- or under-emphasize the density of the items. This results from the "clumping" of these items, causing a quadrat sample to either get none or very many in one sample. Transects do not evidence this characteristic. Furthermore, transects provide better estimates of the variability present.

Judge, et al., (1975:107) confirms these results in tests conducted with archeological sites. Sampling at the 20 percent level of intensity, transects provided better estimates than quadrats and nonrandom techniques provided better estimates than did random models (figure 3).

These results argue for the use of transect over quadrats and, when information for an area is such that strata may be defined and correlated with site location, a nonrandom approach is clearly indicated. Our experience has been that we must most often use the randomized approach despite the realization that some stratified design would probably produce better results. Future work is anticipated that will use stratified sampling models, but this application will be restricted to areas where previous work allows the justification of the strata in site locational terms.

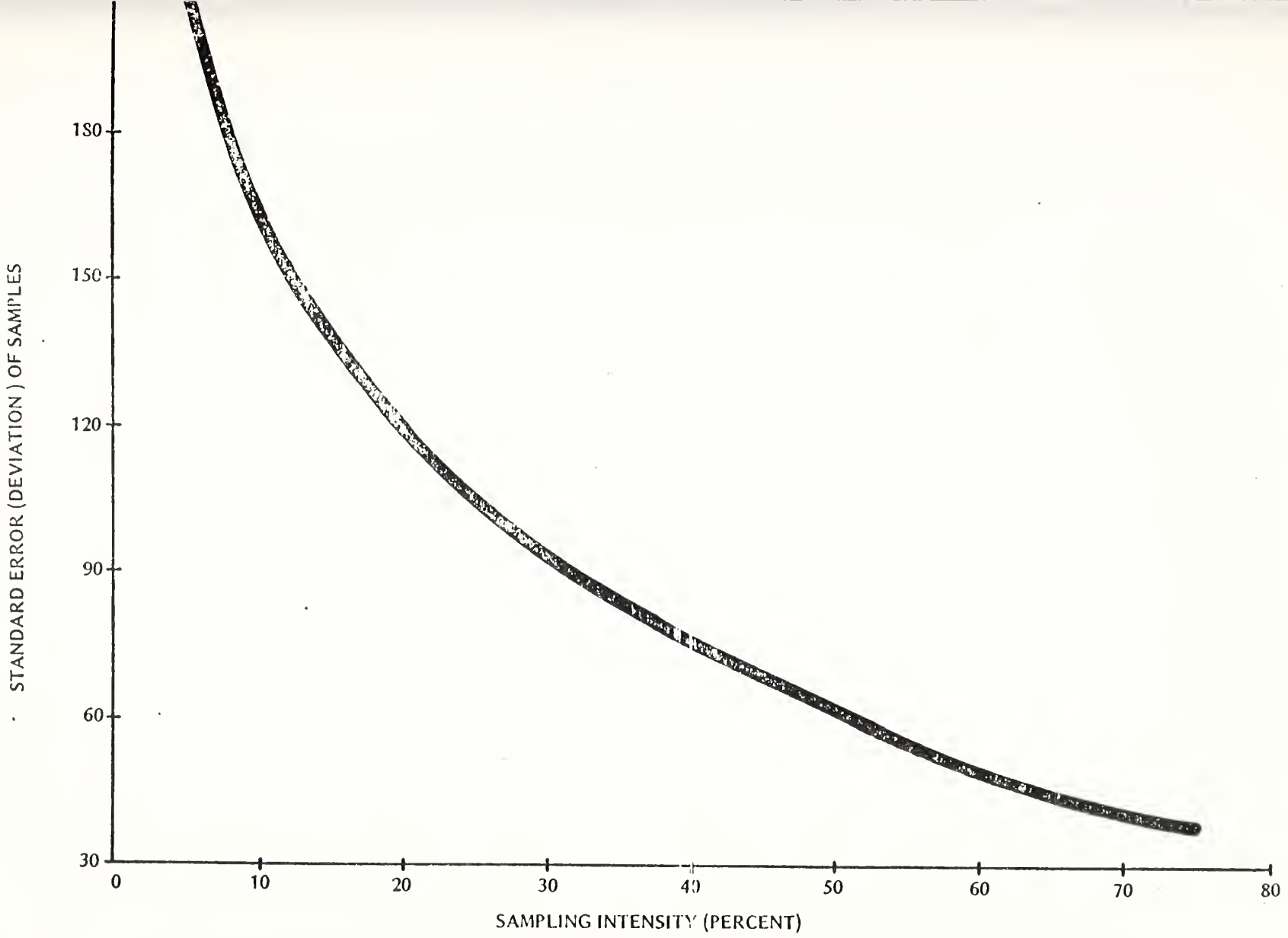


FIGURE 1 - RELATIONSHIP OF THE VARIATION OF SAMPLE STANDARD DEVIATION TO SAMPLE INTENSITY BY PERCENT (BASED ON DeBLOOIS 1975:118, TABLE 10).

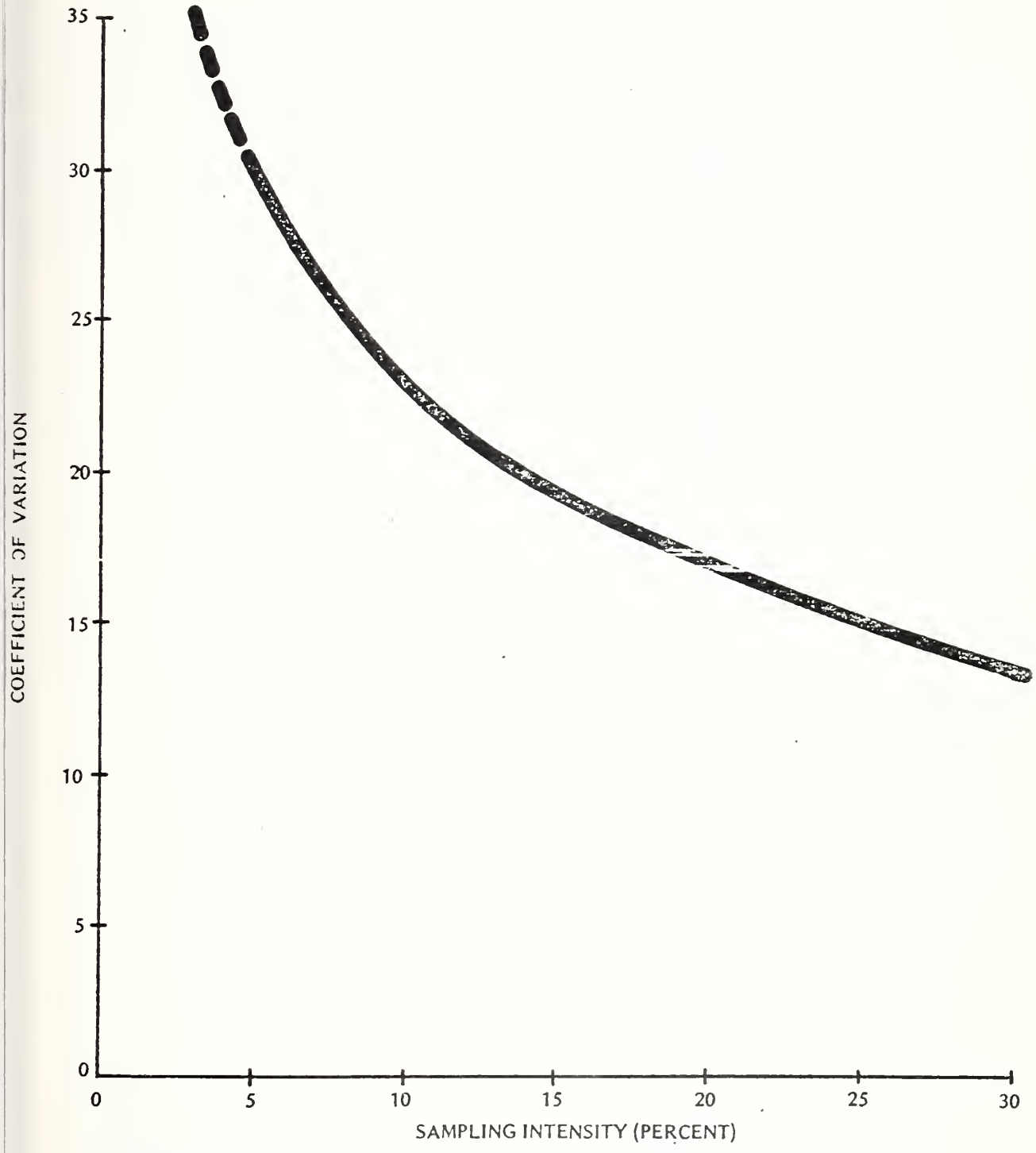


FIGURE 2 - THE RELATIONSHIP OF SAMPLE VARIATION TO SAMPLE INTENSITY BY PERCENT (COMPUTED FROM INFORMATION IN DeBLOOIS 1975, TABLE 10).

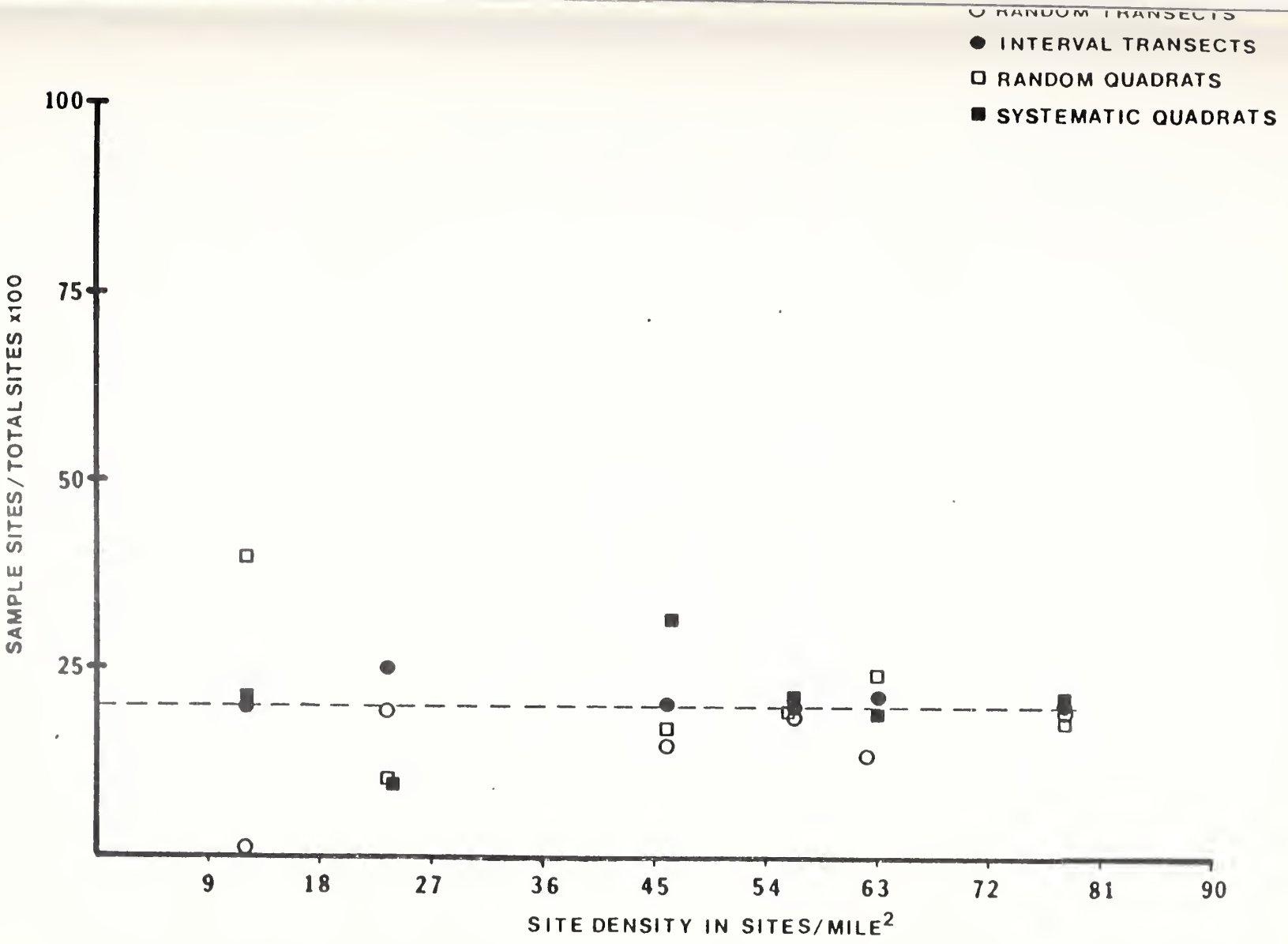


Figure 3. Relationship of site density to percentage of sites occuring in sample. Sample intensity is approximately 20 percent. Taken from data in Judge et al. (1975).

One final area of concern that has not been dealt with in quantified terms is the relationship of site density to the results of a sampling strategy. It is intuitively apparent that in areas where site densities are quite low, i.e., one site per square mile and less, that sample intensities lower than perhaps 10 percent will probably not yield much information. However, the effect of the relationship between site density and sampling intensity on site density estimates is not completely clear. It is clear, though, that an investigation of this relationship is critical to further aid in determinations regarding sampling levels for various projects. Until data can be compiled, this subject will have to be left without further comment.

Survey Methods

The methods of survey employed on the Golondrino Timber Sale are somewhat different than those used on the adjacent areas cited for comparison, i.e., the Gallina and Poso areas. The surveys of the Gallina and Poso Timber Sales (Smith, 1975a, 1975b) were both surveys that employed explicit sampling methods. The Golondrino survey (Dick, 1975a) represents a de facto sample. About 50 percent of the total 3,556 acres on Golondrino Mesa have been surveyed to date; however, Dick will complete his survey most probably during the next field season. The sampling methods used on the Poso and Gallina areas are detailed in Smith (1975a, 1975b), but generally employed the use of randomly aligned transects whose total acreage surveyed approximated 10 percent of the total acreage in the sale area. The results of these surveys are compared mainly to evaluate different intensities of survey in areas that are archeologically similar.

The General Setting

Mesa Golondrino, the area of the three surveys, is not a mesa in the geomorphological sense of the term since it is not a steep-sided tableland on all sides. It is more like a giant terrace connected to Dead Man Peak and Gallina Mountain on the northwest and north ends which slope generally toward the east, north and south.

From the air, the mesa looks rather like a long, slender arrowhead with the tip pointing southeast. The tip is formed by the erosional processes of the two important rivers of the area, the Rio Chama

Canyon forming the eastern side and the Rio Gallina forming the cliffs on the southwestern side. On the west side, a tributary of the Rio Gallina, Canyon de Alameda, separates parts of Dead Man Peak from the mesa. To the west, a chain of mountains (Dead Man Peak, Gallina Mountain, and Gallina Peak) forms a ridge along that side. Northwest of Sargent Tank, the mesa is attached to the Gallina Mountain. Running down the center of the northern half of the mesa is the Hogback, a steep ridge that acts along with the Dark Canyon on the east to rather effectively cut off the northeastern quarter of the survey area (the Poso sale area) from the rest of the mesa.

There are, at present, only four water sources in the area. Two are man-made cattle water tanks--Golondrino Tank in the southern part of the mesa and Sargent Tank in the central section, both of which contain water during the dry season. Two natural springs are also present. Poso Spring lies 1.7 miles north of Sargent Tank in the mountainous terrain of the Hogback, and Aragon Spring which is at the extreme northern end of the area.

From a higher elevation, the mesa appears as a large green park covered by a climax vegetation of ponderosa pine, occasional Douglas fir, and on the rock edges are stands of pinyon and juniper. Intermixed with the ponderosa pine are dense thickets of scrub oak. The ponderosa pines are generally widely spaced, and large open swards are not uncommon throughout the area.

The river waters below two sides of the mesa are located some 1,500 feet almost vertically below the top. The Rio Gallina is an ephemeral stream that is highly mineralized, silt laden, and generally not considered to be potable. Several springs issue along the edges of the stream at the base of the steep cliffs. The Rio Chama, on the other hand, contains a permanent flow of good mountain water.

Archeological Data

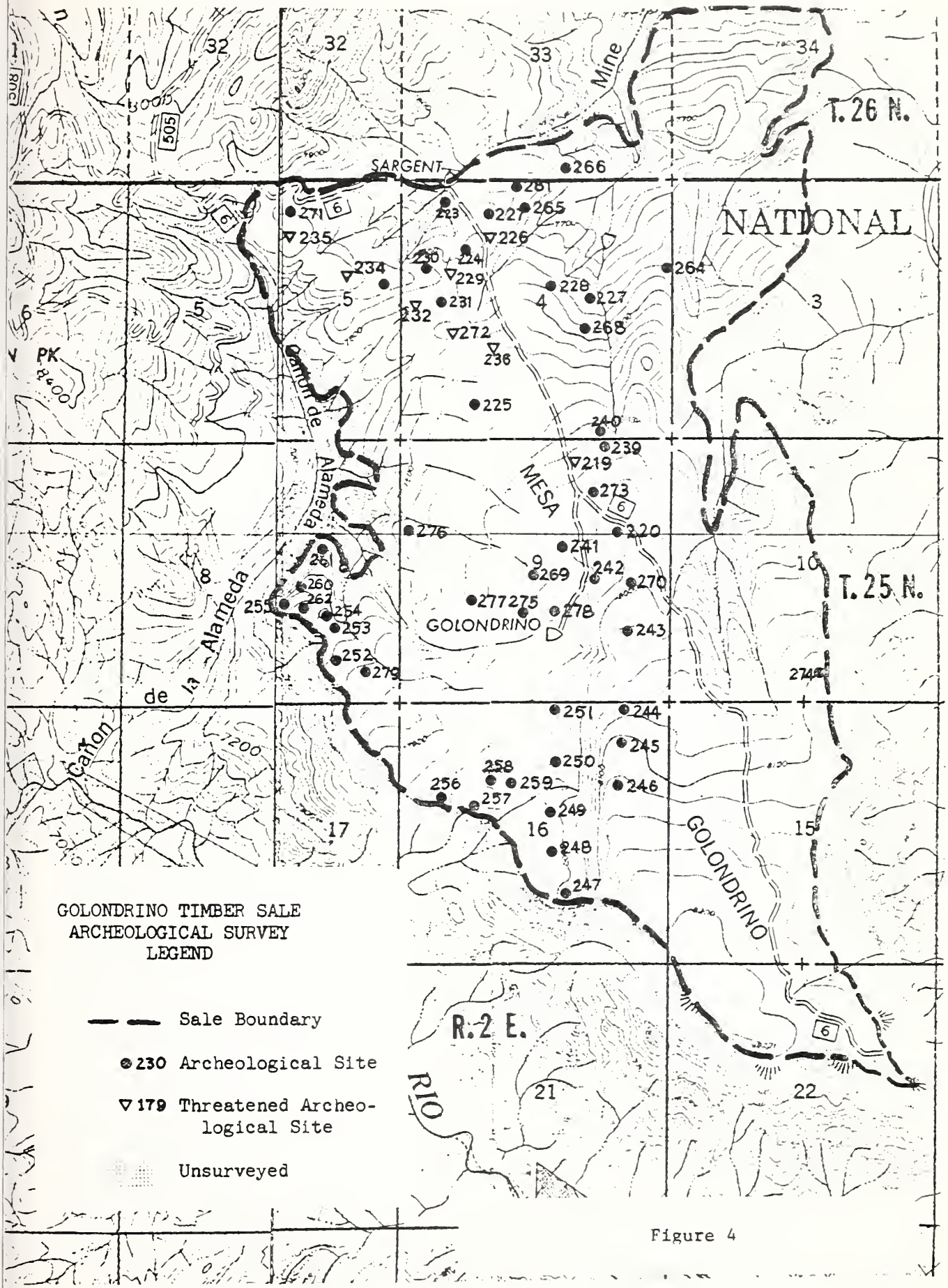
Since the results of the survey of the Poso and Gallina areas have been already presented elsewhere (Smith, 1975a, 1975b), the primary thrust of this section will be with the sites located in the area of the Golondrino Timber Sale.

With approximately 50 percent of the total area of the south end of this mesa now surveyed, some 59 archeological sites have been located, recorded, and marked on the ground. (See maps, figures 4 and 5.) The following general observations and comparisons appear to be in order.

A comparison of predicted site densities between the Golondrino, Gallina, and Poso areas suggests some general settlement patterns. The Golondrino and Gallina areas both contain relatively large numbers of sites. Densities for these two areas are near 20 sites per square mile (.03 site/acre). The Poso area, on the other hand, reflects a density approximately half that of the first two. A 10 percent sample of the Poso area located only two sites and one diffuse lithic scatter and isolated projectile points in the 247 acres surveyed. It would appear that prehistoric use of this part of the total area was decidedly less than it was for the Gallina and Golondrino sections. Whether the Hogback and Dark Canyon acted prehistorically to limit movement to, and use of, the northeastern part of our study area can only be an area for further study.

Since the material from Golondrino (Dick, 1975a) represents the largest sample and, therefore, probably best reflects the parameters of the sampled population, it will be used here to characterize the general area. It should be pointed out, though, that the samples drawn from the Gallina and Poso sale areas do not contradict the patterns in the Golondrino sample.

Three broad types of sites are noted: stone surface structures, adobe structures, and pit houses. Pit houses are the most numerous form, outnumbering all other surface structures about six to one and accounting for 36 percent of the total structures (Dick, 1975a, figure 6 of this report). Pit houses were also dominant in the samples from the Gallina and Poso areas. The distribution of sites by room numbers is what would be expected. Single room sites predominate, representing 34 percent of all sites found. In addition to the house and storage structures, Dick (1975a) also reports evidence that some of the drainages were dammed near their source. There are examples near sites 254 and 275 (see figure 4). Douglass (1917:15) suggests that near ruin 43 (our site number 275), situated on the north bank of a broad draw, there was an ancient reservoir which was used by cattlemen in 1917 just as it still is today. The additional embanking is more recent. It now forms Golondrino Tank.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PK
8400
7200
505
6
32
33
34
5
4
3
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9
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15
16
17
21
22
GOLONDRINO TIMBER SALE
ARCHEOLOGICAL SURVEY
LEGEND
Sale Boundary
230 Archeological Site
179 Threatened Archeological Site
Unsurveyed

Figure 4

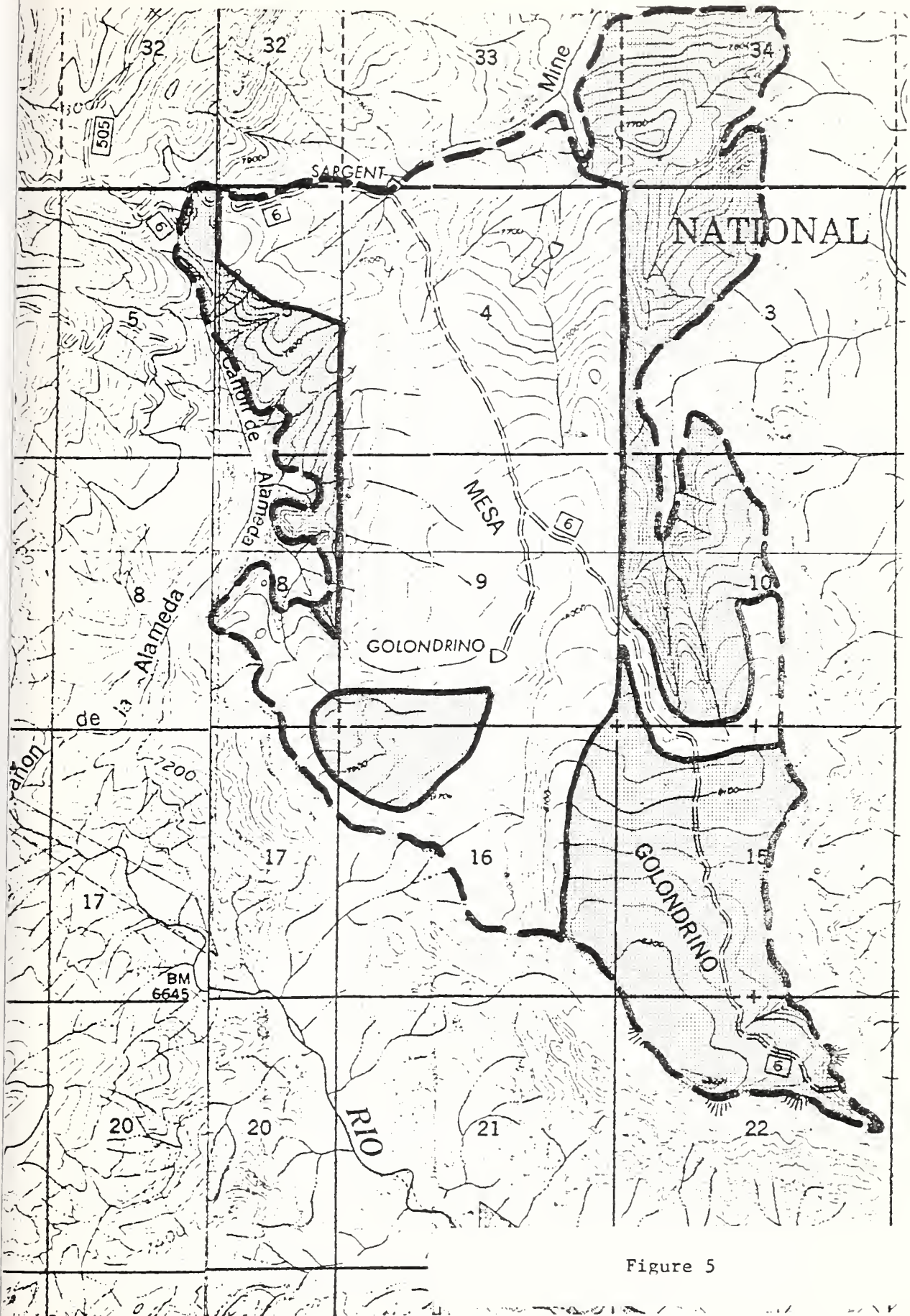
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Figure 5

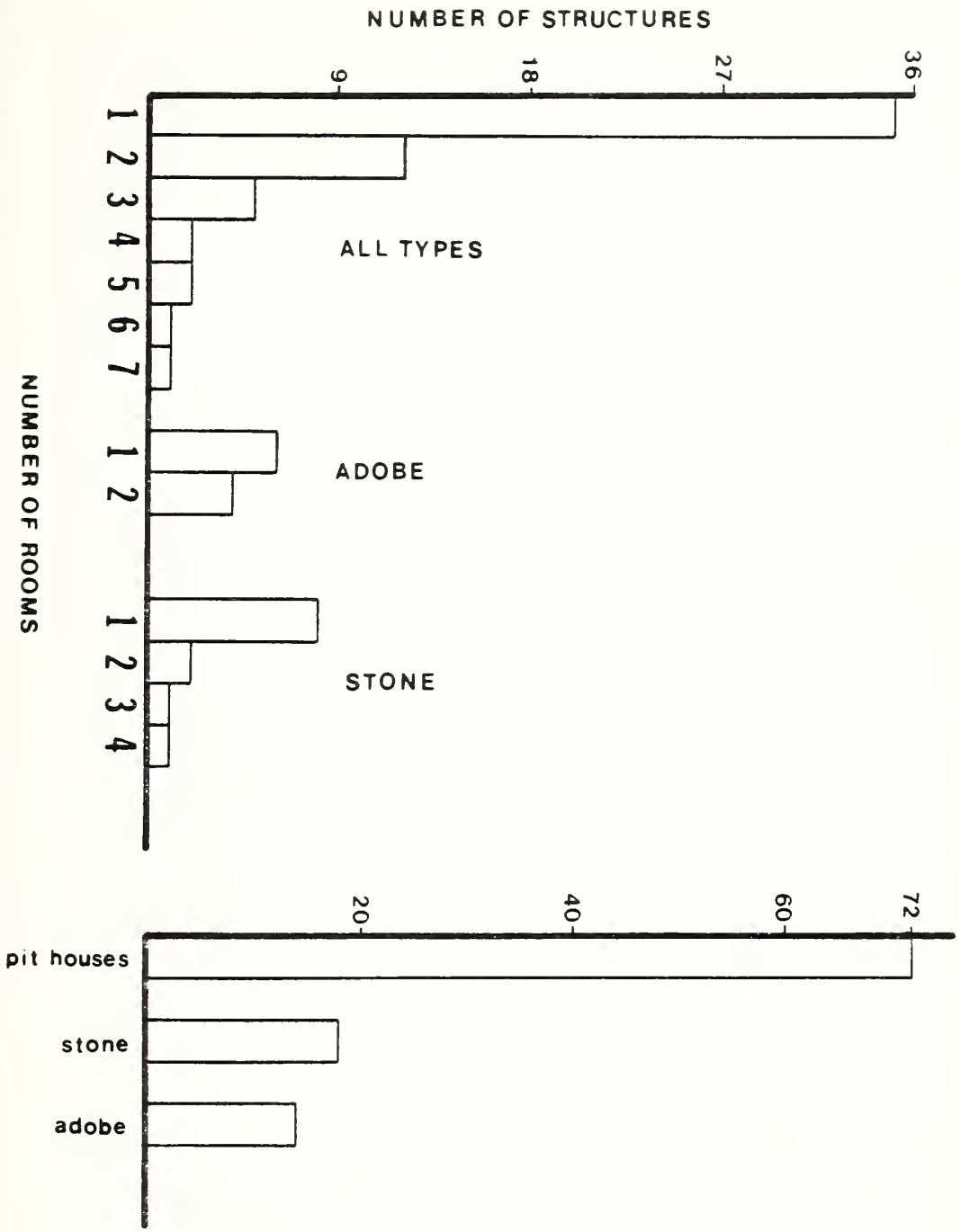

Figure 6 Distribution of structures by room number and by type. From data in Dick (1975)

In summary then, the Llaves area appears to be the northeastern enclave of the Gallina culture which spans the time period from A. D. 800 to 1250 (Dick, 1975b:4, 50; Robinson and Warren, 1971:11, 13). The sites reported on here seem to further support Dick's initial suggestion that these peoples were a high mesa and mountain adapted group; and, in support of this, he points out that while their sites may be found located up to the edge of mesas such as Golondrino, they apparently do not cross the Chama River (Dick, 1975b:4). It does seem clear that spring locations and water control systems argue for the importance of potable water to the understanding and interpretation of the prehistoric settlement patterns (Dick, 1975a:1-2, 1975b:6).

It is anticipated that further work in this general area will undoubtedly alter some aspects of the patterns presented here. However, these initial studies have acted to provide a framework within which work may be structured.

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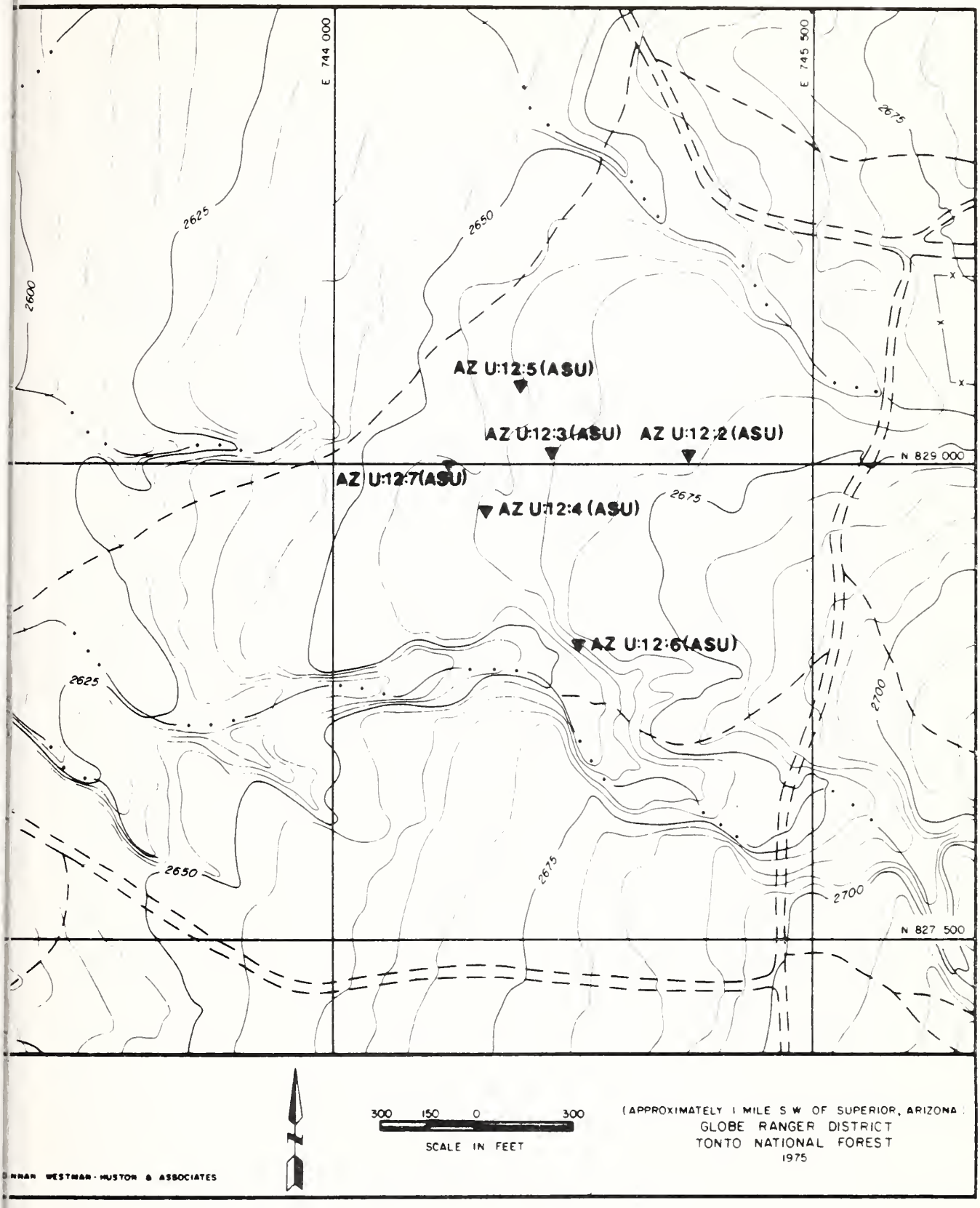
INTRODUCTION TO THREE PAPERS ON AZ U:12:2 (ASU)

During two successive field seasons, from December 1974 through April 1975 and December 1975 through January 1976, the series of small sites discussed in part or in whole in the following three papers were investigated by the Southwestern Region of the U. S. Forest Service. These sites lie near Superior, Arizona, on the Tonto National Forest; and the complex, as a whole, consists of several small prehistoric dwellings and ramadas with an associated system of check dams and water control devices. Also present and investigated were several trash mounds and roasting pits. The general location of the sites and nearby area is shown in figure 1.

The following three papers were written as part of a detailed study of the materials recovered during the excavations and were intended for inclusion with the preliminary report. Since the completion of two of the papers (M. E. McAllister and P. Rule), subsequent excavations were conducted, the preliminary report structure significantly changed, and the final publication date set forward. The Miscellaneous Papers volume is being used as a vehicle to get the information contained in these papers to the profession with less time lag than would result if, as was planned, they were appended to the preliminary report.

The detailed study of these small and unimpressive sites is already producing significant insights into the prehistory of the area through the studies of the flotation material (Gasser, 1976), and settlement patterns and paleoenvironment (Smith, 1976; Wood, n.d.). The following papers add to that information.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SCALE IN FEET
(APPROXIMATELY 1 MILE S W OF SUPERIOR, ARIZONA)
GLOBE RANGER DISTRICT
TONTO NATIONAL FOREST
1975
NNAN WESTMAN · HUSTON & ASSOCIATES

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PAPER NUMBER TEN

AN ANALYSIS OF THE GROUND STONE TOOLS RECOVERED FROM SITES AZ U:12:2 (ASU) THROUGH AZ U:12:7 (ASU)

Tonto National Forest, Arizona

BY
S. L. McAllister

Introduction

This section of the report examines the ground stone tools collected during the excavation of five sites (AZ U:12:2, 3, 4, 5, and 7 (ASU)) on the Superior base for exchange land. (AZ U:12:6 (ASU) was surface collected, but not excavated.)

Each of the tool types (manos, metates, grinding slabs, anvils, axes, and palettes) will be discussed for each site. Tables of attributes noted for each piece of ground stone examined follow the text of this section.

AZ U:12:2 (ASU)

Manos and Rubbing Stones

Six manos and rubbing stones were excavated from this site. Of these, two are whole and four are fragmentary. All of these tools are made from locally available raw materials: basalt, fine-grained granite, sandstone, or welded tuft.

Two of the fragmentary manos are ground on extant ends, indicating their use with trough metates. The remaining four stones are not ground in this manner, suggesting they were used with a basin metate, a grinding slab, or with no nether stone. Three of these stones, F.S. #110, F.S. #196, and F.S. #264, have such non-symmetrical use surfaces that it is likely they were used as rubbing stones. Two of these, F.S. #110 and F.S. #196, were used secondarily as pounding implements. F.S. #110 had pounding wear on both its ends. F.S. #196, a fragmentary stone, was battered on its grinding surface to a much greater extent than the usual pecking/sharpening wear. As this stone is a fragment, this wear may be a result of use as a hammerstone after its fragmentation.

Grinding Slabs

Two grinding slabs were collected at this site. One of these, F.S. #36, is a dressed slab of porphyritic schist, a raw material not found in the immediate vicinity of the site. One side of this slab has been polished and ground smooth from use as a grinding implement.

F.S. #259 is a ridged slab made from locally available sandstone. The use area is defined by a ridge approximately 2.25 cm. in width extending completely around it. The grinding portion of this slab is .75 cm. lower than the surrounding ridge and flat/concave in shape. This slab has been resharpened by pecking the grinding surface. (See figure 1.)

Metates

Eight metates were recovered from AZ U:12:2 (ASU), one whole metate and seven fragments. Of these, three are full troughs, four are indeterminate troughs, and one is a slab metate with a mortar pecked into the grinding surface. (See figure 2.)

All of these metates are made from locally available raw materials: welded tuft, fine-grained granite, vesicular basalt, or granite gneiss. The one metate fragment made from the granite gneiss (F.S. #268B) has an exceptionally smooth grinding surface. The trough of this metate runs with the grain of the stone.

The interior of the east and west walls of this site was lined with stone slabs standing on end. Three of the metates found at the site, F.S. #195, F.S. #266, and F.S. #268B, were used to line the walls. One of these, F.S. #195, is whole, leading to speculation that this was a usual storage place for the tool when it was not in use. No other whole metates were found in this situation, making it impossible to verify this supposition on the basis of this sample.

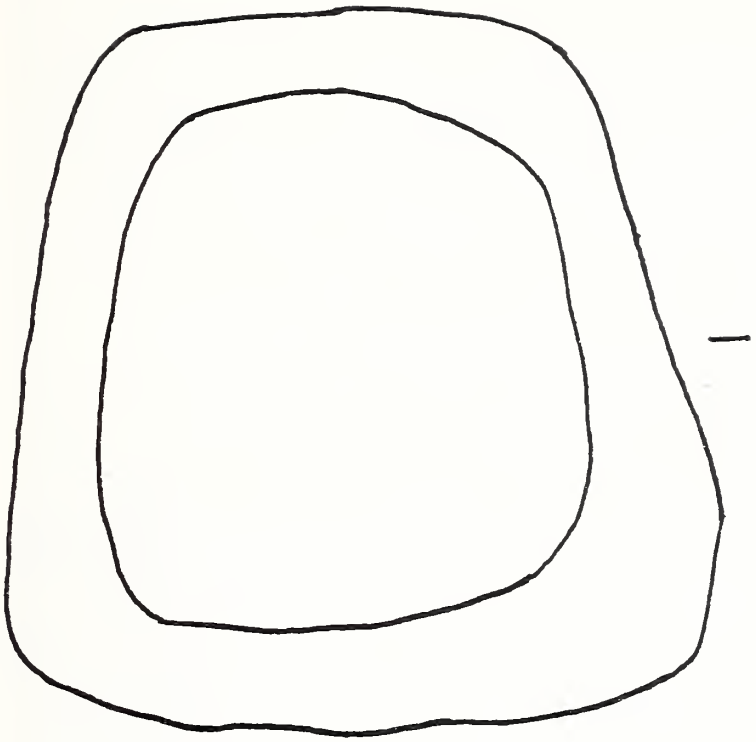
Another of these fragments, F.S. #226B, is part of the side wall of a deep trough metate. The base of this fragment has been evened, and the top of the trough wall has been used as a polishing or stropping implement.

AZ U:12:3 (ASU)

No ground stone tools were encountered during the excavation of this site (which consisted of agricultural terraces).

Figure 1.

AZ U:12:2 (ASU)
F.S. #259
Ridged Grinding Slab
Scale 1:2



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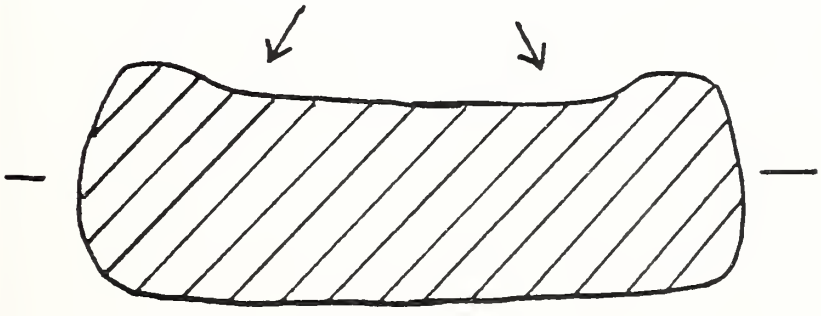
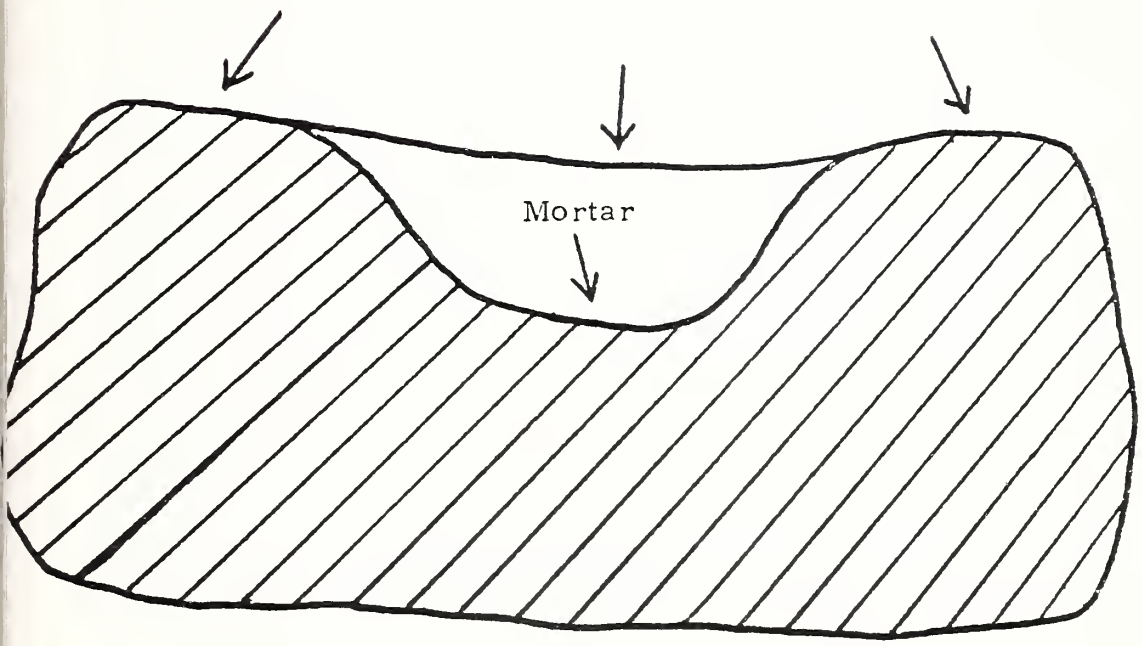


CROSS SECTION

Figure 2.

AZ U:12:2 (ASU)
F.S. #268
Slab Metate w/ Mortar
Scale 1:2



LONGITUDINAL SECTION

AZ U:12:4 (ASU)

Manos

The two manos (one fragment, one whole) collected at this site are fully shaped for use with trough metates. Both of these tools have grinding on their ends.

They are made from locally available raw materials--granite and welded tuft.

The fragmentary mano, F.S. #20, is battered on its extant end. This probably occurred after fragmentation and is indicative of its use, in the fragmentary state, as a hammerstone.

3/4 Groove Ax

One three-quarter groove ax was recovered at AZ U:12:4 (ASU). This ax was made from green diorite, a nonlocal raw material.

The blade of the ax has been shortened due to extensive use and resharpening. Both ends of this tool have extensive battering/pounding wear. This battering indicates this tool's use as a hammerstone, probably after the ax had become too shortened from resharpening to allow continued use as a cutting tool. (See figure 3.)

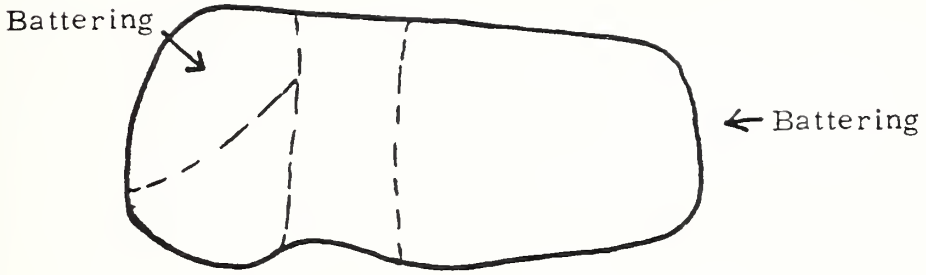
Grinding Slabs

Two fragmentary grinding slabs were found at this site. Both are made from locally available raw materials--sandstone and welded tuft.

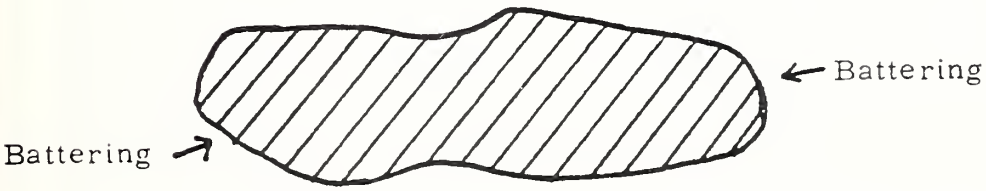
One of these slabs has a flat use surface with diffuse grinding over the entire surface; the other has a slightly concave use surface.

It is interesting to note that although the two manos found at this site were used with trough metates, the only two nether grinding stones encountered are slabs.

Figure 3.
AZ U:12:4 (ASU)
F.S. #24
3/4 Groove Ax
Scale 1:2



FORM



CROSS SECTION

AZ U:12:5 (ASU)

Manos

Three manos were collected during the excavation of this site. All are made from locally available raw materials--welded tuft or fine-grained granite.

Two of these tools (one fragment, one whole) were shaped to their general, loaf-shaped form. They were used on one side only. Each of these was ground on extant ends indicating use with a trough metate. The whole mano, F.S. #39, was found sitting in a deep trough metate on the floor of the room. Both the mano and metate are made from the same raw material--welded tuft. (See figure 4.)

The third stone is a one-handed cobble modified solely by use. This stone, fine-grained granite, was used only on one surface. It is probable that this stone was not used with a metate, but rather for other grinding activities.

Metates

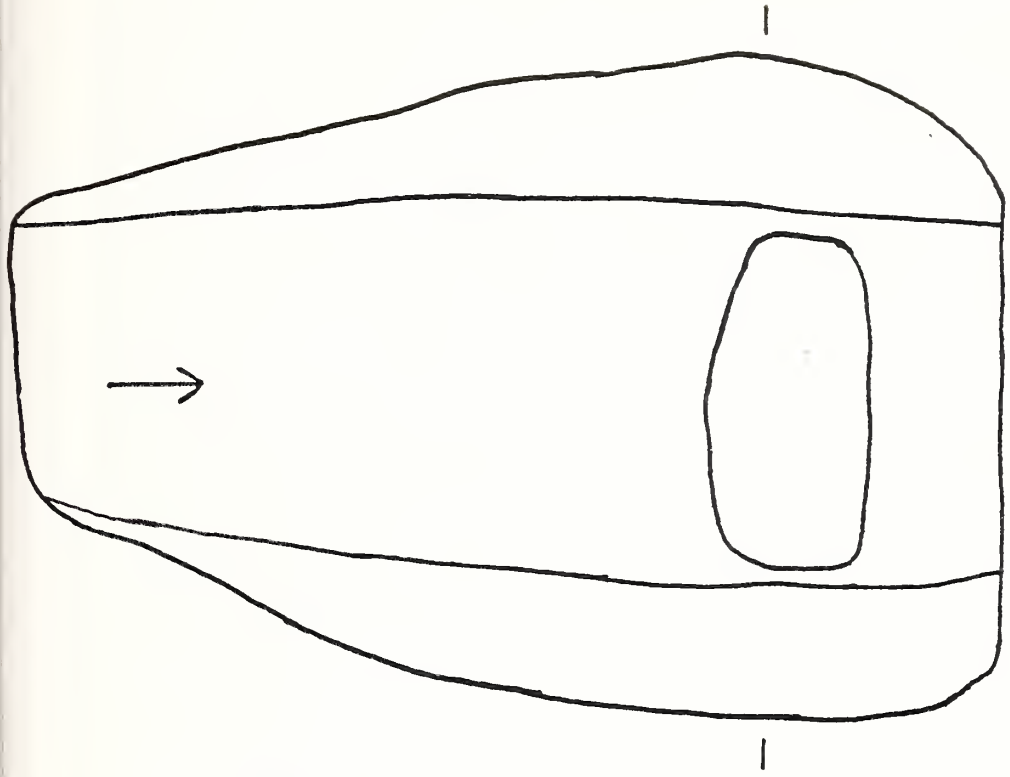
Eight metates, metate fragments, and grinding slabs were recovered from AZ U:12:5 (ASU). Of these, four are trough in form, three are basin or slab, and for one the form cannot be ascertained. These were made from a variety of locally available raw materials: vesicular basalt, welded tuft, and sandstone.

Technological modification of the raw material ranged from the working of complete troughs into the surface of the stone, to use of a conveniently shaped slab for grinding purposes.

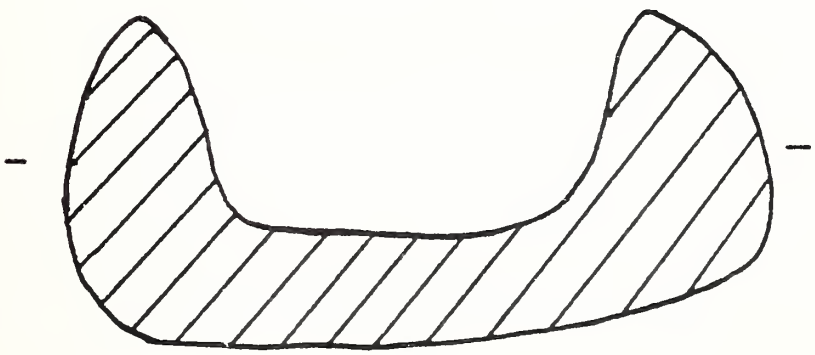
The one whole metate, F.S. #38, was encountered at floor contact about 53 cm. below surface. A mano, F.S. #39, was sitting in the deep trough of this metate. These two tools were located in the northwest quarter of the room, next to a built-up storage area. (See figure 5.)

Several of the fragmentary slabs and metates, F.S. #70, F.S. #108, and F.S. #109, had been reused after fragmentation as wall construction material.

Figure 4.
AZ U:12:5 (ASU)
F.S. #'s 38 and 39
Mano & Metate
Scale 1:4

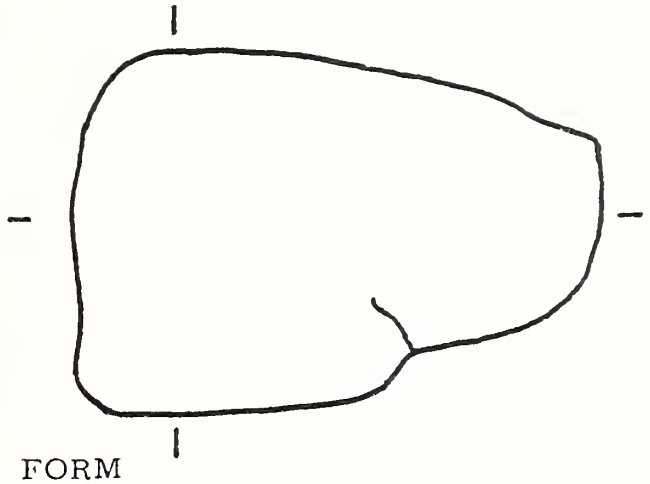


FORM

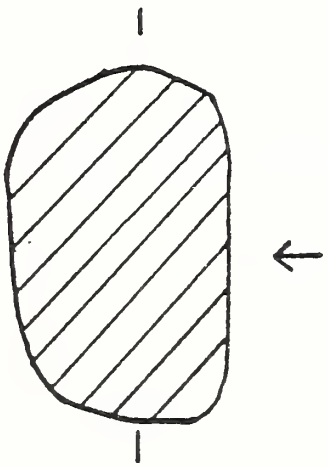


CROSS SECTION

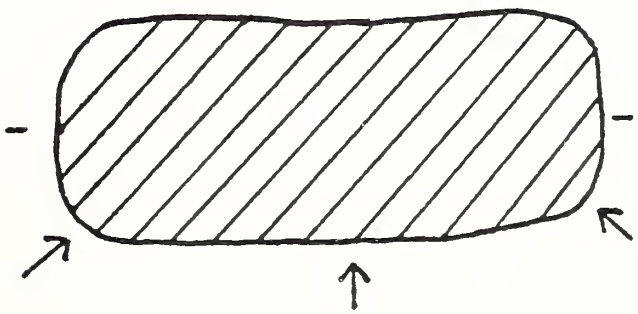
Figure 5.
AZ U:12:7 (ASU)
F.S. #14
Mano
Scale 1:2



FORM



CROSS SECTION



LONGITUDINAL SECTION

Anvil

One anvil was collected at this site. This was an irregularly shaped piece of sandstone with a flat use surface and base. There is pecking, on one side only, over the center of the stone.

3/4 Groove Ax

One three-quarter groove ax was found at this site. This tool is made from green diorite, a nonlocal raw material.

The basal portion of this ax is battered, indicating the tool's use as a pounding implement. A large flake has been removed from one side of the blade. This probably occurred accidentally during resharpening of the tool.

AZ U:12:6 (ASU)

Anvil

One anvil was collected from the surface of this unexcavated site. This tool was made from locally available sandstone. No attempt was made to modify the form of this stone, which has parallel base and use surfaces. Pecking occurred on only one surface of this stone. This use surface is very slightly concave (a depression of .2 cm. - .3 cm.).

AZ U:12:7 (ASU)

Manos

Two mano fragments and one whole mano were recovered from this site. The two fragments fit together to form one whole tool.

The whole mano, F.S. #14, is a fine-grained sandstone cobble. There is grinding on both ends of the stone indicating its use with a trough metate. This cobble has been modified by use only and has been used on only one surface. The use surface and top of this stone are roughly parallel, but the form is quite irregular. (See figure 5.)

F.S. #1 and #2 are both fragments of one sandstone mano. Together they form a whole tool.

This mano has only one use surface. There is grinding on both ends indicating use with a trough metate.

This mano is a conveniently shaped cobble modified solely by use. This and the other mano found at this site, F.S. #14, are unique among the manos found at these sites that were used with trough metates. They are the only two with no technological modification other than that produced by use.

Metates

Two nether stones were collected from this site. One of these, F.S. #24, is a grinding slab made from fine-grained sandstone. There is diffuse grinding over the entire surface of the slab. This stone is conveniently flat and modified solely by use. The form is quite irregular.

F.S. #30 is a shallow, full trough metate. This tool is made from locally available fine-grained granite. The use surface of this tool is pecked rather than ground. This suggests that the tool was quite new, the trough having been recently pecked into the surface of the boulder, or that the trough had been very recently sharpened.

Palette

One palette fragment was encountered at AZ U:12:7 (ASU). This is part of a ridged slab. The flat grinding surface is situated .3 cm. below this ridge. The palette is made from a very fine-grained siltstone which is available locally.

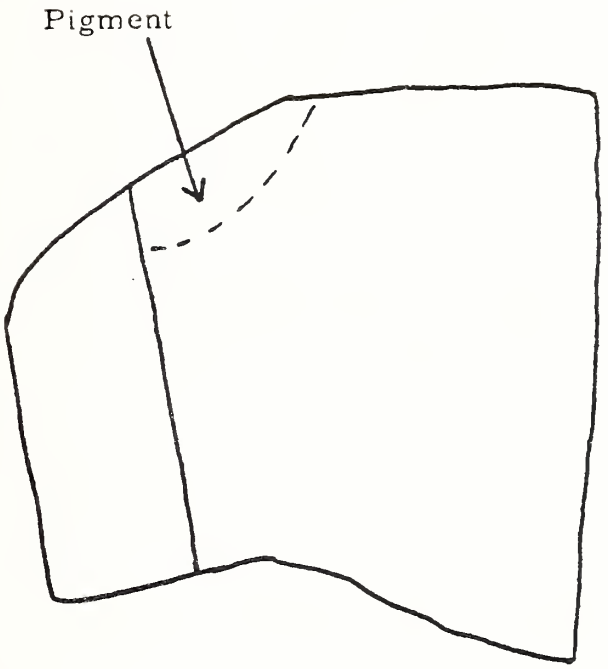
Red pigment remained on the grinding surface of this tool. (See figure 6.)

Conclusions

It has been assumed by some investigators that the ephemeral nature of surficial architectural and artifactual remains at some sites is indicative of seasonal or special-activity occupation at those sites (Doyel, 1974:8, 53-54). It is suggested that since large sites, "some upwards of 50 rooms," existed contemporaneously with

Figure 6.

AZ U:12:7 (ASU)
F.S. #20
Palette fragment
Scale 1:1



these smaller sites, that the smaller sites were "special use or seasonal sites somehow associated with the larger pueblos . . ." (Doyel, 1974:8). Alternatively, it is possible that permanently occupied sites of the same cultural and temporal affiliations may have varied greatly as to size and total artifact inventory.

What is important is not sheer numbers of rooms and artifacts, but the numbers and types of artifacts available to each family (represented here by individual habitation units) at the particular site. Each family unit would need a certain number and a certain variety of tools for subsistence purposes. At permanently occupied sites the number and variety of artifacts would be the same for each family or habitation unit regardless of the total number of rooms or artifacts present. Although the total number of tools and the nature of the artifact inventory may differ at large sites and small sites, the number and variability of the tool inventory for each habitation unit within the same site or between sites of the same temporal and cultural affiliations should be the same if the sites are occupied year-round.

A hypothesis that presents this concept of the interrelationship of the artifact inventory (specifically ground stone tools) and the degree of permanence of site occupation is: If the ground stone tool inventory for each habitation unit at large and small sites of the same cultural and temporal affiliations is the same, then the sites exhibit the same degree of seasonal or permanent occupation.

Persons occupying a particular site on a year-round basis would need a minimal inventory of ground stone tools for subsistence purposes. Sources dealing with ethnographic cultures in the American Southwest emphasize the importance of ground stone implements, especially metates and manos, in the home furnishings of sedentary, agricultural peoples.

> In a corn culture . . ., where their very life depended on their crops, what was the most important thing in their homes, if not their grinding stones (Bartlett 1933:3).

> On the floor, along one side of the room, is the most important furniture of all--three narrow bins, made of stone slabs. Inside each one is a grinding slab . . . . On the stones lie the cylindrical <u>manos</u> or handstones . . . with which the grinding is done (Underhill 1946:85).

Underhill (1946:85) indicates that two or three metates (occasionally more) and the associated manos are basic, necessary household tools for the Western Pueblo family.

These figures agree with those cited by Bartlett (1933) for two permanently occupied sites excavated by the Museum of Northern Arizona. One of these sites, LA 1764, consisted of two rooms. Two mealing bins and seven trough metates were excavated at this site (Bartlett 1933:7). This averages to one mealing bin and 3.5 trough metates for each habitation unit. Another site, LA 1176, consisted of one room. Two trough metates were excavated here (Bartlett 1933:11). There is no data on numbers of manos or other ground stone tools found.

How do these data compare with the ground stone inventory excavated at the Superior sites? Table 1 presents the ground stone tools excavated at the various sites. (AZ U:12:6 (ASU) is not included since this site was surface-collected, not excavated.) Table 2 summarizes the numbers and variability in the various site inventories. Table 3 indicates the nature of architectural features at each site.

If any of these sites are permanently occupied, one would expect the ground stone tool inventory at that site to be similar in numbers to those inventories mentioned by Bartlett (1933) and Underhill (1946).

There are only two sites of the five that have definite room structures or habitation units. These are AZ U:12:2 (ASU) and AZ U:12:5 (ASU). These two sites also have the greatest numbers and variability in their ground stone tool inventories. The number of metates present at these two sites is similar to the numbers suggested by Underhill (1946) as minimal for a permanently occupied habitation unit in the ethnographic record (two or more). These numbers are also similar to or greater than the numbers of metates found at LA 1764 and LA 1176 (Bartlett 1933:7, 11). The other three sites have one or zero metates in their ground stone tool inventories.

The data suggest that of these five sites, AZ U:12:2 (ASU) and AZ U:12:5 (ASU) were occupied with a similar degree of permanence and that these sites would have been occupied for a greater proportion of the year than any of the other three sites excavated.

The numbers of metates present at these two sites would be suggestive of year-round occupation if one considers ethnographic and archeological data from other areas in the Southwest. However, it is necessary to gather data on ground stone inventories for a much greater range of sites of this same temporal/cultural period before any definite conclusions can be made.

Table 1 - Ground Stone Tool Inventory by Site

Site	Manos/ Rubbing Stones	Trough Metates	Ind. Metates/ Slabs	Mortar	Ridged Slab	Ax	Anvil	Palette	Total
U:12:2	6	7	1	1	1	0	0	0	16
U:12:3	0	0	0	0	0	0	0	0	0
U:12:4	2	0	2	0	0	1	0	0	5
U:12:5	3	4	4	0	0	1	1	0	13
U:12:7	2	1	1	0	0	0	0	1	5
Total	13	12	8	1	1	2	1	1	39

Table 2 - Number/Variety of Tools by Site

Site	Total Number of Tools	Number of Types
U:12:2	16	5
U:12:3	0	0
U:12:4	5	3
U:12:5	13	5
U:12:7	5	4

Table 3 - Architectural Features by Site

Site	Rooms	Ramadas	Terraces
U:12:2	1	1	0
U:12:3	0	0	1
U:12:4	0	1	0
U:12:5	1	0	0
U:12:7	0	1	0

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1933 Pueblo Milling Stones of the Flagstaff Region and Their Relation to Others in the Southwest: A Study in Progressive Efficiency. Museum of Northern Arizona Bulletin, No. 3. Flagstaff, Arizona.

Doyel, David E.

1974 The Miami Wash Project: A Preliminary Report on Excavations in Hohokam and Salado Sites Near Miami, Central Arizona. Tucson, Arizona: The Arizona State Museum.

Underhill, Ruth

1946 Work a Day Life of the Pueblos. United States Indian Service, Indian Life and Customs, No. 4. Phoenix, Arizona.

PAPER NUMBER ELEVEN

DESCRIPTION AND ANALYSIS OF THE POLYCHROME POTTERY EXCAVATED FROM SUPERIOR, ARIZONA, AZ U:12:2 (ASU)

Tonto National Forest

BY
M. E. McAllister

Introduction

The polychrome sherds excavated to date from the Superior site (AZ U:12:2 (ASU)) have been analyzed. The analysis format selected for use is taken from Guidelines: Museum of Northern Arizona Ceramic Series (Smith and Lipe, eds., 1973). A modified version of this format was utilized in analyzing each polychrome sherd of the 192 which are present in the U:12:2 collection. The results obtained are summarized in the description which follows.

Description

I. Construction

--Coiled

II. Finishing or Thinning

--Scraped

(In some cases, a slightly uneven contour was found to occur on one or both surfaces of the sherd.)

Comment: Although the technique of manufacture was occasionally difficult to determine due to the small size of the sherd, it was obvious that most or all of the sherds were made utilizing the coil and scrape technique. As was noted, a few sherds have slightly uneven surface contours which are suggestive of the paddle and anvil technique. However, it could not be established definitely that any of these sherds came from vessels which were manufactured by this technique.

III. Firing Method

--Oxidizing atmosphere

(Indicated by paste color and surface colors.)

Comment: The vessels from which the sherds came were not fired in a pure oxidizing atmosphere. The black (organic) paint would have disappeared had this been the case. However, they

were fired in an atmosphere which tended toward an oxidizing state. This identification has been confirmed by A. E. Dittert, Jr. (personal communication).

IV. Paste

A. Clay

--Residual

Comment: This identification has been confirmed by Dittert (personal communication).

B. Color

--Color names: red, reddish brown, dark reddish brown, light brown, brown, dark brown

Comment: The color terms given under the "color names" heading are color values as seen by the analyst and are, therefore, impressionistic. In most cases, they match the color name given for the corresponding Munsell value in the Munsell Soil Color Charts. However, in some cases, they do not (e.g., in the Munsell Soil Color Charts, the color name "reddish yellow" is given for the value 5YR 6/6, as opposed to the name "light brown" given for this Munsell value above).

C. Temper

--Medium amount of slightly rolled, very fine to coarse grained mixed stream sand, including quartz, felspar, and other igneous material.

(Temper grain size scale is taken from Gifford, ed., 1953:6; very fine--.25 mm or less, coarse--1.0 mm to 2.0 mm.)

Comment: This identification has been confirmed by Dittert (personal communication).

D. Texture

--Medium - slightly blocky
--Coarse - blocky

Comment: Both conditions are common among the sherds.

E. Carbon Streak

--Present - thick (more than half the thickness of the sherd wall)
--Present - medium thickness (half the thickness of the sherd wall)
--Present - thin (less than half the thickness of the sherd wall)
--Faintly present
--Absent

Comment: The most commonly observed condition among the sherds is the presence of a thick carbon streak.

V. Surface

A. Colors

--Red, light reddish brown, reddish brown, dark reddish brown, or brown slip:

--Color names:	--Munsell values:	Freq.:
light red	10 R 6/6	1
red	10 R 5.5/8	2
	10 R 5.5/6	2
	10 R 5/6	15
	10 R 4.5/8	4
	10 R 4.5/6	12
	10 R 4/6	5
	2.5 YR 6/6	2
	2.5 YR 6/6-5/6	1
	2.5 YR 5.5/8	1
	2.5 YR 5.5/6	4
	2.5 YR 5/6	33
	2.5 YR 5/5	1
	2.5 YR 4/8	2
	2.5 YR 4/6	6
	2.5 YR 4.5/4	3
	2.5 YR 4/4	5
light reddish brown	2.5 YR 6/4	1
	5 YR 6/4	3
	5 YR 5.5/6	1

--Color names:	--Munsell values:	Freq.:
reddish brown	2.5 YR 5.5/4	1
	2.5 YR 5/4	8
	2.5 YR 4/4-4/2	1
	5 YR 6/4-5/4	1
	5 YR 6.5/4	1
	5 YR 5.5/4	2
	5 YR 5/4	8
	5 YR 5.5/3	1
	5 YR 5/3	6
	5 YR 4/4-4/3	1
	5 YR 4/3	2
	5 YR 4/3-4/2	1
dark reddish brown	2.5 YR 3/4	1
	5 YR 3/2	1
brown	7.5 YR 5/6	1
	7.5 YR 6.5/4	2
	7.5 YR 6/4	9
	7.5 YR 5.5/4	3
	7.5 YR 5/4	5
	7.5 YR 5.5/2	1
	10 YR 7/3	1
	10 YR 6.5/3	1
	10 YR 6/4	2
	10 YR 6/3	14
	10 YR 5.5/3	6
	10 YR 5/3	2
	10 YR 5/2	3
	10 YR 5/2-4/2	1

--White, gray, or dark gray slip:

--Color names:	--Munsell values:	Freq.:
white	10 YR 8/3	3
	10 YR 8/3-8/2	2
	10 YR 8/2.5	3
	10 YR 8/2	125
	10 YR 8/2-8/1	3
	10 YR 8/1.5	7
	10 YR 8/1	3
	10 YR 7.5/3	1
	10 YR 7.5/1	1

--Color names:	--Munsell values:	Freq.:
gray	10 YR 7/2	2
	10 YR 7/1	3
	10 YR 6.5/2	1
	10 YR 6.5/1	7
	10 YR 6/2	2
	10 YR 6/1.5	1
	10 YR 6/1	4
	10 YR 5.5/6	1
	10 YR 5.5/1	8
	10 YR 5/1	5
	N 7.5	1
	N 5.5	2
	N 5	2
dark gray	10 YR 4/1	2
--Black paint:		
black	N 4	4
	N 4-3	2
	N 3.5	1
	N 3	175
	N 2.5	1

Comment: As was noted above in relation paste color values, the color names assigned impressionisticly by the analyst may or may not match those given in the Munsell Soil Color Charts for corresponding Munsell values.

The frequency figures given above represent the number of sherds on which each color value occurred. The total number of polychrome sherds excavated to date is 192. However, the frequency totals for each color category will not necessarily equal 192 due to: (1) the absence of certain color categories from certain sherds, and (2) the presence of more than one color value for certain color categories on certain sherds.

It is interesting to note the range of variation in color values, especially in the red to brown category. As is indicated by the frequency figures, the most preferred

color combination appears to have been: red--2.5YR 5/6; white--10YR 8/2; and black--N3. However, each color category has a number of alternative color values in addition to what appear to be the preferred values: red to brown--47; white to dark gray--22; and black--4. The significance of this range of variation, if any, remains to be determined.

B. Firing Clouds

--Absent
--Present

Comment: Fire clouds were observed on only a few of the sherds.

C. Sooting

--Absent

Comment: Sooting was not observed on any of the sherds.

D. Finish

Interior:
--Smooth; polished--striations visible
--Smooth; polished (?)--striations visible on some portions of the sherd, but not on others (1 sherd only)
--Slightly gritty; unpolished (1 sherd only)

Exterior:
--Smooth; polished--striations visible
--Slightly granular; unpolished (1 sherd only)
--Not determinable--eroded

Comment: The sherds exhibited a high degree of uniformity in evidence of surface finishing.

E. Slip

(For the Munsell values for the color names used below, see V.A. above.)

Interior:

--White; thick--crazed
--White; medium thickness--crazed
--White; medium thickness--slightly crazed
--White; medium thickness--uncrazed
--Gray; thick--crazed
--Gray; thick--slightly crazed
--Gray; medium thickness--crazed
--Gray; medium thickness--uncrazed
--Dark gray; medium thickness--slightly crazed
--White to dark gray slip absent
--Brown; thin

Comment: The most commonly observed condition is a thick white (10YR 8/2) slip which is crazed.

Exterior:

--Red; thin
--Brown; thin
--Reddish brown; thin
--Light reddish brown; thin
--Dark reddish brown; thin
--Brown; very thin
--Brown to red; thin
--Red; thin; and white; thick--crazed
--Red; thin; and white; thin
--White; thick--crazed
--White; medium thickness--uncrazed
--Gray; medium thickness--uncrazed

Comment: The most commonly observed condition is a thin red (2.5YR 5/6; 10R 5/6) or brown (10YR 6/3) slip.

VI. Shape

A. General Terms

--Bowl (?) (6 sherds are indicative of this shape.)
--Jar (?) (1 sherd is indicative of this shape)
--Not determinable (185 sherds)

Comment: Definite shape identifications cannot be made because no reconstructable vessels are present in the polychrome sherd collection excavated to date.

B. Points

(See drawings under D below)

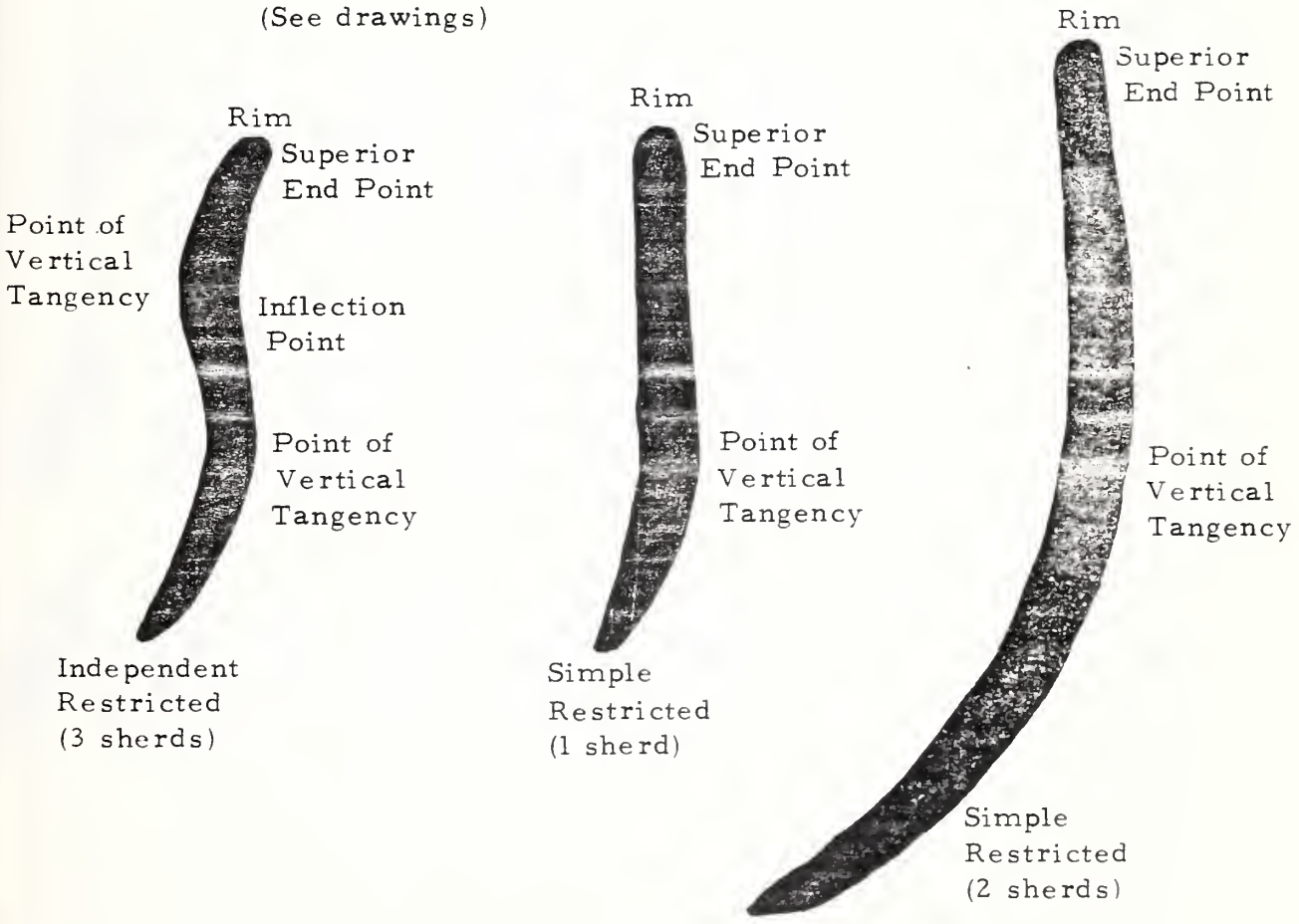
C. Structural Class

--Independent restricted (?) (4 sherds are indicative of this structural class.)
--Simple restricted (?) (3 sherds are indicative of this structural class.)
--Not determinable (185 sherds)

Comment: Structural class identifications cannot be made with certainty due to the absence of reconstructable vessels in the polychrome sherd collection excavated to date.

D. Vessel Profile

(See drawings)

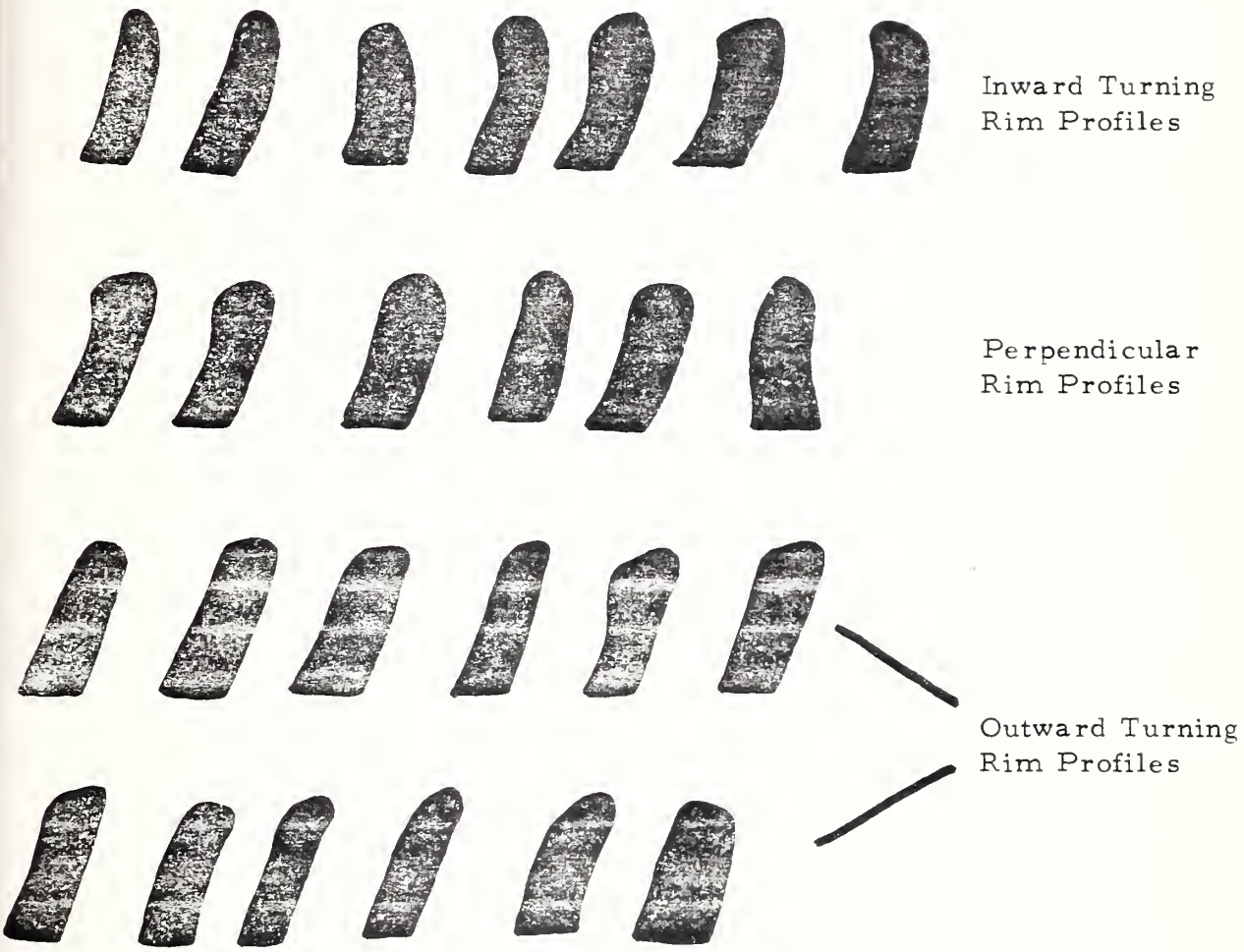


(Vessel profile--determinable for 6 sherds)
--Not determinable (186 sherds)

Comment: Vessel profile could not be determined for one of the seven sherds for which shape in general terms and structural class were identifiable.

E. Rim Profile

(See drawings below)



--Not determinable (157 body sherds)

Comment: Thirty-five rim sherds are present in the collection of polychrome sherds excavated to date. Numerical or alphabetical formulae are not used for the rim profiles as per the instructions for the analysis format (Smith and Lipe, eds., 1973:6).

VII. Measurements

A. Wall Thickness

--Range average (in millimeters):

3	(constant)
3-3.5	
3-4	
3-5	
3-5.5	
3.25-3.5	
3.5	(constant)
3.5-4	
3.5-6	
4	(constant)
4-4.5	
4-5	
4-6	
4.5	(constant)
4.5-5	
4.5-5.5	
4.5-7	
5	(constant)
5-5.5	
5-6	
5-7	
5.5-6	
5.75	(constant)
6	(constant)
6-6.5	
6-7	
6.5-7	

Comment: The "constant" designation utilized above indicates that the sherd wall thickness does not vary.

Measurements are not called for in the analysis format selected for use (Smith and Lipe, eds., 1973). However, other authorities (e.g., Gifford, ed., 1953:4) indicate that they should be recorded when possible.

B. Other Measurements

--Not determinable (all sherds)

Comment: All of the polychrome sherds are fragmentary to the extent that no other measurements except wall thickness could be obtained.

VIII. Decoration

A. Surfaces and Areas Treated

(For the Munsell values for the color names used below, see V.A. above.)

Interior:
--Black paint on white slip
--Black paint on gray slip
--Black paint on dark gray slip
--Black paint - white to dark gray slip absent
--White slip - black paint absent
--Brown slip

Comment: The most commonly observed condition is black (N 3) paint on a white (10YR 8/2) slip. In cases in which either the black paint or the white to dark gray slip is absent, breakage is undoubtedly responsible for causing the alteration from the more commonly observed pattern (black on white to dark gray).

Exterior:
--Red slip
--Brown slip
--Reddish brown slip
--Light reddish brown slip
--Dark reddish brown slip
--Red slip and black paint on white slip

--Black paint on white slip
--Black paint on gray slip
--Black paint on red slip
--Reddish brown slip and white slip
--Brown slip and black paint on white slip

Comment: The most commonly observed condition is a red (2.5YR 5/6; 10R 5/6) or brown (10YR 6/3) slip.

B. Pigments

--Iron: red, brown, reddish brown, light reddish brown, and dark reddish brown
--Kaolin: white, gray, and dark gray
--Carbon: black

C. Colors

For color names, see VIII.A. above; for Munsell values, see V.A. above.

D. Permanence

--Paint and slips - non-fugitive

E. Technique of Application

--Brushing
--Not determinable - black paint absent

F. Polishing Over Paint

--Present
--Absent (1 sherd)
--Not determinable - black paint absent

G. Designs

1. Areas Treated

--Interior
--Interior and exterior
--Exterior

Comment: The most commonly observed condition is design painting on the interior.

2. Subdivision of Areas

--Not determinable (all sherds)

Comment: All of the polychrome sherds excavated to date are fragmentary to the extent that it was not possible to make this determination. In general, a whole or reconstructed vessel or the major portion of a vessel is required in order to observe subdivision of areas.

3. Symmetry

--Not determinable (all sherds)

Comment: The comments made above with regard to subdivision of areas (VIII.G.2.) also apply to the observation of symmetry for this sherd collection.

4. Balance

--Positive
--Negative (some sherds with painting on the exterior)
--Not determinable - black paint absent
--Not determinable - white slip absent

Comment: The most commonly observed condition among the sherds is positive black over white design painting on the interior. The other culturally produced condition listed above (negative) is rare.

5. Patterning

(See the illustrations at the end of the report for representations of the more complex forms of patterning observed on certain sherds.)

On various rim sherds:
--Medium line at rim
--Wide line at rim

--Broad line at rim
--Very broad line at rim
--Broad line slightly below rim
--Thin line at rim; below which is wide open band
--Medium line at rim; below which is wide open band
--Very broad line at rim; below which is wide open band
--Medium line at rim; below which is thin open band; below which is fine line
--Medium line at rim; below which is fine open band; below which is thin line
--Wide line at rim; below which is wide open band; below which is medium line
--Tapered medium line at rim; below which is slanted open band
--Not determinable - due to fragmentary state (many sherds)
--Not determinable - black paint absent
--Not determinable - white slip absent

(Line/open band width scale is taken from Gifford, ed., 1953:6; very fine--1 mm or less, fine--1 to 3 mm, thin--3 to 6 mm, medium--6 to 10 mm, wide--10 to 15 mm, broad--15 to 20 mm, and very broad--20 mm or more.)

Comment: Most of the patterns listed above were observed to occur on one rim sherd only or, at most, on two or three. Each pattern illustrated at the end of the report was found to be present on a single sherd only. As this indicates, only a limited number of patterns can be observed on the sherds. For the most part, the sherds are fragmentary to the extent that patterning cannot be observed.

It should be noted that among the patterns observable, the full range of patterning usually associated with Gila polychrome does not appear to be present. The fragmentary state of the sherds and the fact that only a portion of the site has been excavated may be factors in reducing the range of patterning observable in this collection. However, as will be discussed further later, a cultural factor may also be suggested.

6. Elements and Motifs

Elements:

--Lines: very fine, fine, thin, medium, wide, broad, very broad (lines are frequently present)
--Open bands: very fine, fine, thin, medium, wide, broad, very broad (open bands are frequently present)
--Pendant sawteeth (occasionally present)
--Solid triangles (occasionally present)
--Stepped triangles ? (occasionally present)
--Stepped lines ? (occasionally present)
--Solid rectangles (occasionally present)
--Dots (occasionally present)
--Open rectangles ?
--Pendant solid rectangles
--Tapered medium line
--Tapered broad line
--Tapered fine to medium open band
--Tapered medium to wide open band
--Ticking
--Hook
--Open triangle
--Half terrace ?
--Medium to wide terraced line
--Not determinable - due to fragmentary state (many sherds)
--Not determinable - black paint absent
--Not determinable - white slip absent

(Same line/open band width scale used.)

Motifs:

--Hatching ? (frequently present)
--Lines (various widths) with pendant sawteeth (occasionally present)
--Fringed lines ? (occasionally present)
--Diagonal hatching ? (occasionally present)
--Solid triangles with pendant sawteeth (occasionally present)
--Hatched triangles (?) (occasionally present)
--Ticked lines forming rectangle

--Solid rectangles with exterior ticking ?
--Line breaks ?
--Tapered medium line with pendant sawteeth on both sides
--Hatched rectangle with pendant sawteeth
--Hatched triangle with hook
--Solid rectangle with pendant rectangles
--Hatched circle ?
--Checkerboard ?
--Not determinable - due to fragmentary state (many sherds)
--Not determinable - black paint absent
--Not determinable - white slip absent

Comment: A question mark following an element or motif listed above indicates that the complete element or motif is not actually observable, but that its presence is suggested by the portion of the design visible on the sherd. A question mark in parentheses indicates that in some cases the element or motif is not actually observable, while in other cases it is.

It will be noted that a number of the elements and motifs listed are not indicated to be either frequently or occasionally present. These elements or motifs were found to be present on a few sherds at most, and usually on one sherd only. Lines, open bands, and indications of hatching are the only design features observed to be present frequently. In many cases, the nature of design features was not determinable due to the fragmentary state of the sherds.

As was the case with patterning, the full range of elements and motifs usually associated with Gila polychrome does not appear to be represented in this sherd collection. Possible reasons for this will be considered in the interpretive section which follows.

Preliminary Interpretations

The polychrome sherds excavated to date from the Superior site conform in general terms to accepted type descriptions for Gila polychrome (e.g., Colton and Hargrave, 1937; Haury, 1945). The only indicated anomaly of the sherd collection is the apparent reduction in the range of design features and patterns present in relation to the full range usually associated with Gila polychrome. Elements and motifs generally found to occur on Gila polychrome pottery which are absent or are only minimally present on the U:12:2 polychrome sherds include: several types of triangles, such as solid triangles with a circular open space in the center; scrolls; keys; a wide variety of terraced or stepped elements; and the "bird wing" motif (Colton and Hargrave, 1937:89; Haury, 1945:77-78). The situation is the same for patterning. Many of the patterns recorded for Gila polychrome (see e.g., Haury, 1945:71-77) are not represented in the U:12:2 polychrome collection.

There are several possible reasons for this finding. Two have been mentioned previously. First, the fragmentary state of the U:12:2 polychrome sherds may preclude observation of the full range of design features which were actually present on the vessels when they were produced and used. Second, there is the fact that only a portion of the site has been excavated, so that only a partial collection of polychrome pottery has been available for analysis. When the entire collection is analyzed, the full range of Gila polychrome design features and patterns may be observed. Alternatively, if there is actually a reduced range of design features and patterns on the U:12:2 polychrome, one potential cultural or behavioral explanation which is suggested is that this pottery represents a distinct, locally produced variety of Gila polychrome. This could be of interest in the debate over cultural associations in the area, especially since Casa Grande Red-on-buff is also found at the site.

Of these three potential explanations for the observations indicating that a reduced range of design features and patterns is a characteristic of the U:12:2 polychrome, the third seems the most likely at present. However, an attempt to resolve the question more conclusively will have to wait until the remainder of the material at the site has been excavated and analyzed.

The size of the U:12:2 polychrome sherd collection to date (192 sherds) may also be of interest. Although exact figures are not yet available, it appears that polychrome sherds may be found to constitute a significant percentage of the total ceramic inventory of the site, providing that the level of occurrence encountered to date does not decline drastically as the excavation continues. It can be argued that this finding would be suggestive of one of two phenomena. Either the polychrome pottery was manufactured at the site, as may also be suggested by the evidence referred to previously, or it was brought there in significant amounts.

It has been suggested recently that sites of the U:12:2 type in this area are representative of special use or seasonal occupation (Doyel, 1974). If there was evidence that a significant amount of polychrome pottery was either manufactured at such sites or was brought to them, it would have to be considered in relation to the hypothesis that they were not occupied on a permanent basis. It might be that evidence of this nature would be indicative of a more permanent form of occupation. Further research would be required to determine whether or not this could be a potential behavioral implication of the polychrome pottery recovered at U:12:2.

Conclusion

The results of the analysis of the polychrome sherds excavated to date at the Superior site (AZ U:12:2 (ASU)) indicate that this ceramic material conforms to the type descriptions for Gila polychrome, although one anomaly was noted. In addition, this analysis has suggested the potential behavioral implications discussed above.

Illustrations*

FS 72-16

FS 72-1

FS 81-1

(line of previous juncture between FS 81-1 and FS 81-2)

FS 81-2

* Interior of sherd with black-on-white painting is shown, unless otherwise indicated.

FS 81-3

FS 87-2

FS 96-4 (exterior)

FS 121-2
(interior)

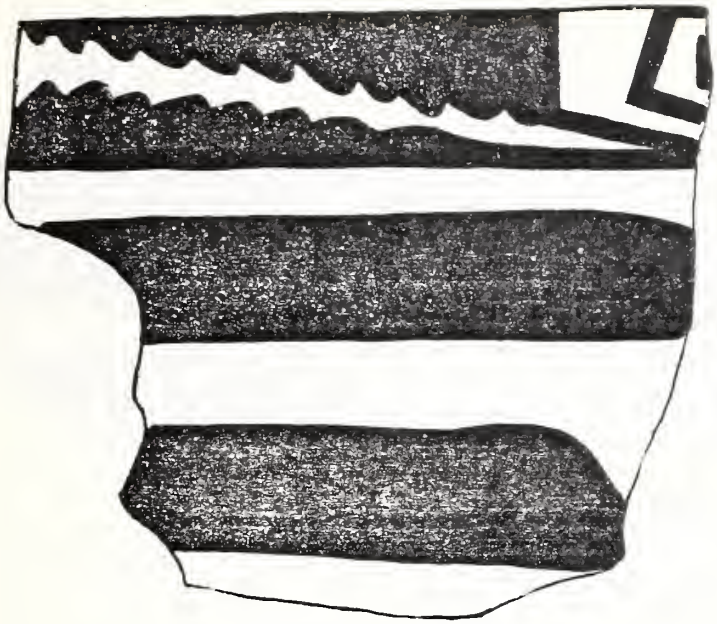
FS 121-2
(exterior)

FS 128-2

FS 138-3

FS 138-8

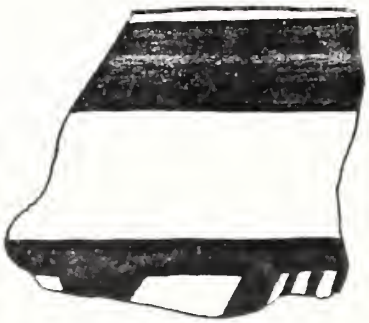
FS 138-10



FS 111-4

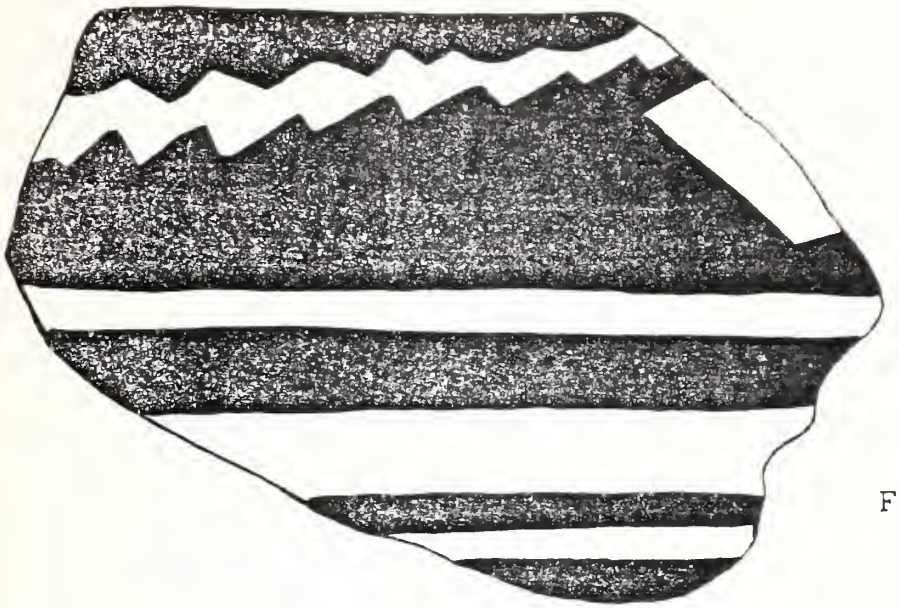
FS 111-13

FS 117-3 (exterior)

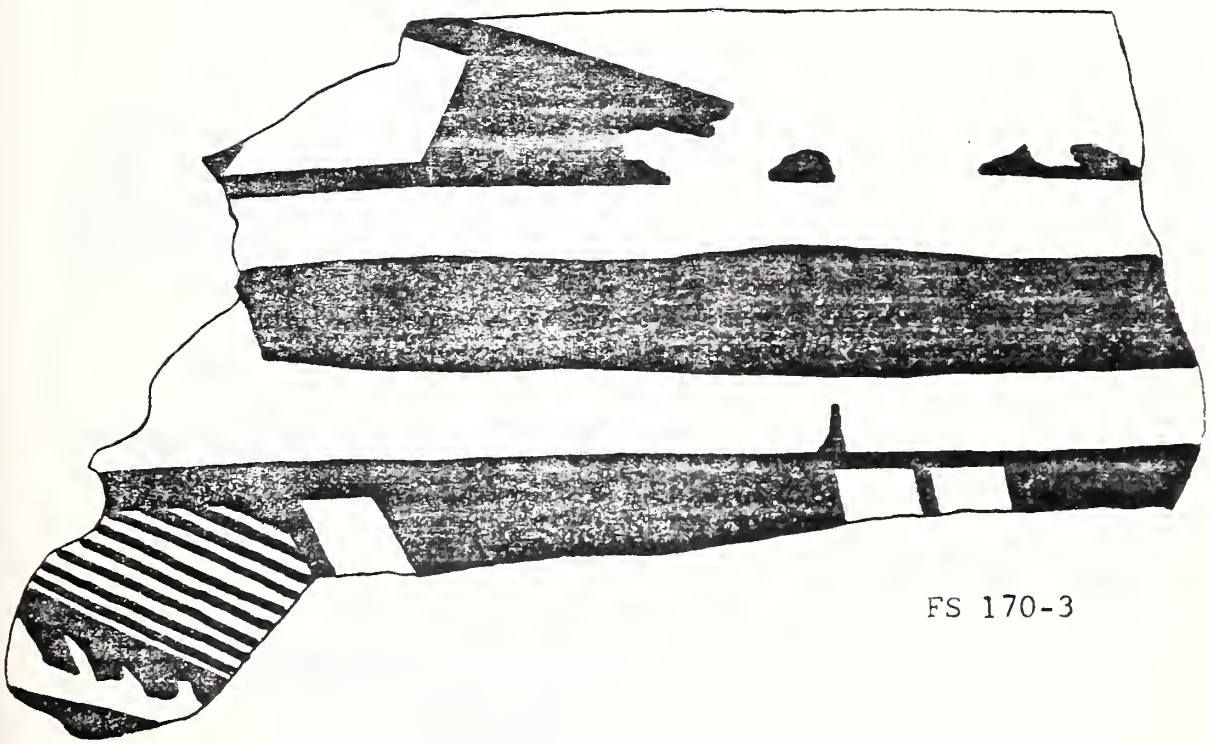


FS 111-17

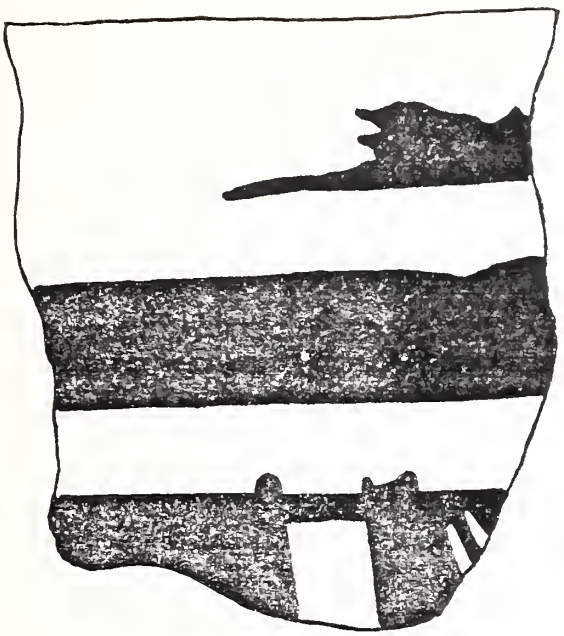
FS 119-9



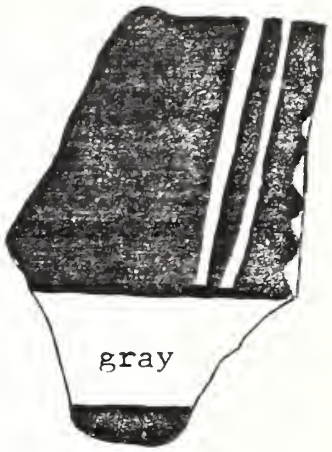
FS 148-5



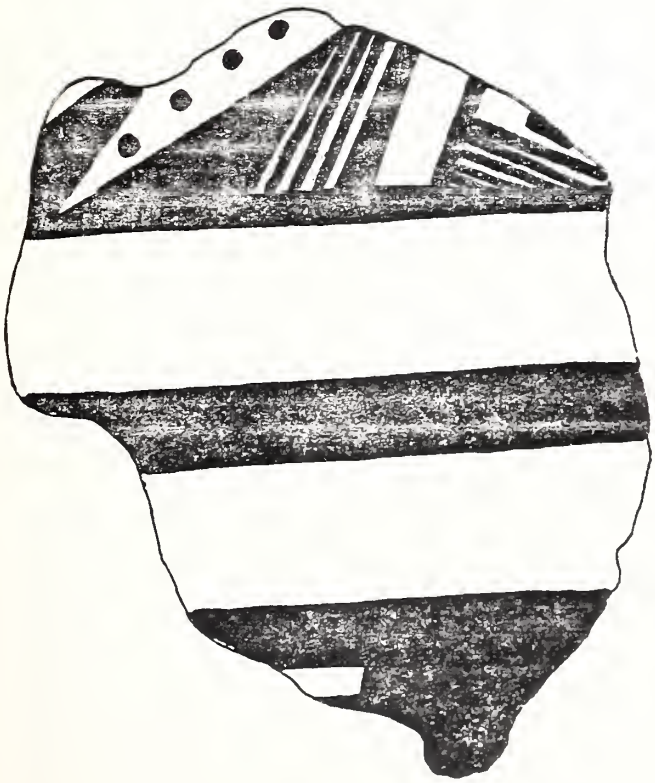
FS 170-3



FS 148-1

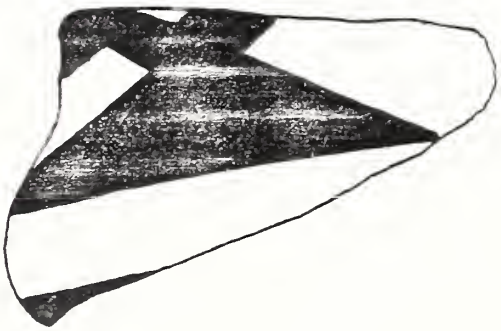


FS 148-3



FS 148-4

FS 170-7



FS 170-8

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PAPER NUMBER TWELVE

AN ANALYSIS OF THE DEBITAGE RECOVERED FROM THE UPPER FLOOR SURFACE OF UNIT C, AZ U:12:2 (ASU)

BY
Pamela Rule

Introduction

Excavation of the upper floor surface of Unit C, AZ U:12:2 (ASU), produced a total of 132 pieces of lithic debitage in actual floor contact. Composing this sample were some 55 complete flakes, 17 partial flakes, 5 complete cores, 3 core fragments, and 52 pieces of nondistinctive lithic material classified as "chips and chunks."

Raw Material Utilization

Nine raw materials were distinguished among floor contact debitage at Unit C. These consisted of the igneous materials obsidian and basalt, the sedimentary element sandstone, and the siliceous minerals chert, quartz, and quartzite. Due to the variety and prevalence of quartzites within the sample, materials of this class were further divided into cherty quartzites, fine-grained quartzites not grading into chert, medium-grained quartzites, and coarse-grained quartzites. Assignment into these categories was made arbitrarily on the basis of visible grain size. The following tabulation indicates the rate of occurrence of the various raw materials within the excavated floor sample, both in terms of numerical representation and percentage of total sample weight.

Material	% of Total Sample	% of Total Sample Weight
chert	28.78	13.46
cherty quartzite	16.66	36.82
fine-grained quartzite	16.66	15.03
obsidian	16.66	0.99
basalt	8.33	8.27
coarse-grained quartzite	6.06	20.12
medium-grained quartzite	5.30	4.02
sandstone	0.75	0.85
quartz	0.75	0.40

Clearly reflected by these figures is preferred utilization of indigenously occurring fine-grained siliceous materials for the manufacture of chipped stone objects. Taken together, the various quartzites numerically represent 44.68% of the total sample and 75.99% of total sample weight. Combined with the figures for closely related chert (which co-occurs with cherty quartzite on

one recovered core), these percentages are raised to 73.46% and 89.45%, respectively. The source of both cherts and quartzites appearing on the site is almost certainly indigenous, such materials occurring abundantly within the desert pavement covering both the site and its environs. With the possible exception of one piece, obsidian occurring within the debitage sample is similarly indigenous in origin. Twenty-one of the 22 recovered obsidian chips, chunks, and flakes are the result of the bi-polar flaking of small, locally occurring obsidian nodules of the type commonly referred to as "Apache Tears." The utilization of this source of obsidian is further indicated at AZ U:12:2 (ASU) by the recovery of three unmodified obsidian nodules in contact with the upper floor surface. Only one obsidian flake was not clearly assignable to an indigenous source, differing from the remainder of recovered obsidian debitage by brown as opposed to black coloration and the absence of technological features indicating bi-polar detachment.

Technology

A comparative analysis of complete flakes (excluding hinged specimens) recovered from the upper floor yielded the following mean values for flake and platform dimensions, and flake angle.

Material	Max. flake length	Max. flake width	l/w ratio	flake angle	platform length	platform width	platform l/w ratio
chert	21.53	23.69	105.04	69.00	14.27	5.50	38.48
basalt	39.70	34.06	81.63	72.50	17.36	9.20	53.63
fine qtz.	24.71	16.45	71.57	74.11	13.76	5.58	40.30
cherty qtz.	22.75	23.69	112.04	80.00	19.62	6.45	33.61
obsidian	insufficient complete flake sample						
medium qtz.	insufficient complete flake sample						
coarse qtz.	insufficient complete flake sample						
quartz	insufficient complete flake sample						
sandstone	insufficient complete flake sample						

A major portion of the variation apparent between the presented mean values is undoubtedly more a function of raw material variation than technological bias. Interesting, however, and possibly of cultural implication, is a tendency toward production of transverse flakes (indicated by length/width ratios over 100)

from both chert and cherty quartzite cores, and an overall tendency toward the production of high angle flakes. Feathered terminations were characteristic of complete flakes at the site, occurring on 78.18% of recovered specimens. The remaining 21.82% of the complete flake sample demonstrated hinge fractures.

Retouch

A total of 8.33% of the debitage recovered from the upper floor surface of Unit C demonstrated retouch. In ten of the eleven instances of retouch, modification was limited to edge nibbling resulting from utilization. In the remaining instance, a cherty quartzite flake demonstrated intentional squamous retouch of the distal end. Some 81.81% of observable retouch occurred on flakes, with the additional 18.19% of retouch occurring on chips and chunks. Cores and core fragments demonstrated no noticeable secondary utilization. Occurrences of retouch on debitage were confined to fragments of the more isotropic materials, occurring on chert (63.63% of total retouch), cherty quartzite (18.18% of retouch), fine-grained noncherty quartzite (9.09% of retouch), and obsidian (9.09% of retouch).